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NOTICES—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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The Dyestuffs Bill

THE text of the Dyestuffs (Import Regulation) Bill, 1920, is published on another page. It is a short measure of four clauses, and agrees substantially with the published forecasts of its provisions. With a view to safeguarding our dye-making industry, it authorises the prohibition, subject to a licensing system, of all synthetic organic dyestuffs, colours, and colouring matters and all organic intermediate products used in their manufacture. The Board of Trade, as the licensing authority, is directed to constitute an advisory committee consisting of five persons concerned in the trades in which goods of the prohibited class are used, three persons concerned in the manufacture of such goods, and three other persons not directly concerned. From the last three the chairman is to be appointed by the Board of Trade. The fee for a licence must not exceed £5. The users of dyestuffs are clearly in a majority and that proportion will be generally approved, but no provision seems to have been made for the representation of the merchant or distributing interest, though promises of a general character had been given

on the point. Does this mean that the Board of Trade has ceased to recognise the British trader as a factor in commerce and supports the action of those manufacturers who refuse to deal with merchants and will only do business with actual consumers? If so, it marks a fundamental change in British trade policy, and indicates that we are to cease being the greatest trader nation on earth in order to attempt to become a nation of manufacturers?

It seems clear from Clause III. that the Bill only seeks to cut out foreign competition so far as home consumption goes. That again appears to indicate that our dyestuffs are to be produced for ourselves and not for sale in foreign markets, where we should have to meet foreign competitors on level terms. The Act is not to apply to goods imported for re-exportation. So the British merchant will still be able to import German or American dyestuffs at however cheap a rate, and re-export them to any markets which require them, though they will not be available to the home consumer. This, of course, will help our export trade and employ our shipping. It is preferable that a British trader who has an order from abroad for half-a-dozen articles should be able to supply them direct, rather than have to ship portions of the goods from some foreign port; for the purchaser finding one article reaching him from America might in future prefer to deal direct with the source of supply and that might mean getting other articles from the same source.

Another point in the Bill is that its provisions run for ten years and no longer from the date of its passage. Ten years was the period originally suggested, and the protected industry thus gets the benefit thrown in of the important assistance it has received up to the present.

The majority of 205 by which the motion to reject the Bill was defeated in the House of Commons on Tuesday evening deprives its opponents of any hope of effective opposition to the main position. It only remains to consider the measure in detail, and to ensure that its machinery is workable, and that its effects will be equitable to all interests. The Government appear determined to see the measure through without delay, and not to allow the whole question to be reopened. Those who object to the principle of the Bill and those who criticise its details now know definitely where they stand. That, in any case, is better than continued uncertainty. The manufacturers will get the security which they ask for and which they are fully entitled to on definite pledges given by successive governments. What is wanted now is a fair and conciliatory spirit in the Committee stage, and after that a co-operative effort to reduce any inevitable inconveniences of the measure to the lowest point.

Japan's Commercial Position

JAPAN, like other countries, but in a more marked degree than most, is undergoing a financial and commercial reaction after her recent extensive adventures in speculation. One of the branches of trade on which Japanese merchants embarked rather recently was chemicals and dyestuffs. In this Japan was by no means alone. Here at home war conditions brought into existence a new type of chemical "merchant" who floated in on the speculative flood and may quite possibly before long float out again. In fact, in some cases the return journey has already been completed, and the bona-fide merchant is gradually recovering his old place and influence in the trade. One of the branches of chemical industry in which Japan seriously overdid it was fertilizers. According to Mr. E. F. Crowe, Counsellor to H.M. Embassy in Tokio, in 1913 the import of fertilizers into Japan amounted to over 70 million yen, or about 10 per cent. of the total imports—an extraordinary figure as it was regarded at the time. Yet by 1919, partly owing to the increase in the price, the total had increased to 190 million yen. Even this figure was surpassed in the first seven months of 1920, when fertilizer imports rose to 200 million yen, or 12 per cent. of the total imports. The rice crop, for which these fertilizers were largely imported, unfortunately shows no proportionate increase, for while the output was 57 million koku in 1914, the 1920 crop is estimated at 58 million, only one more. As regards chemicals, it is stated that "the same spirit of speculation which induced the over-buying of beancake, nitrates, and sulphate of ammonia, brought about wild purchases in excess of requirements of caustic soda, soda ash, carbolic acid, and other chemicals." The quite natural result is that great losses have been incurred and large quantities have had to be re-exported.

Anxious as the position is, it is reassuring to have Mr. Crowe's opinion that Japan as a whole is financially sound. In spite of the heavy excess of imports over exports, the yen to-day is worth nearly 3s., instead of 2s. 0½d., the par rate of exchange. This fact, coupled with the large and steady imports of gold, proves to him that Japan's finances are on a sound basis and that her banks are well supplied with funds, though they are showing extreme caution in lending them. "In any case," he writes, "she is far better off than she was at the end of the Russo-Japanese War, when she had failed to exact an indemnity and was burdened by a heavy external debt. To-day she is a creditor rather than a debtor nation, and she now possesses many large factories and mills. The question is often asked, 'Where has all the money gone to which these speculators have lost?' The reply is that in part the grains were merely on paper, but there have undoubtedly been large sums spent on bricks and cement and plant, which in time to come, when prices find their level, will once more give a return on the money invested in them. The bankruptcy of a few rash speculators would clear the air and would tend to sounder business in future. The chief danger is that there are so many ramifications between the commercial and the political world that it may be thought necessary to bolster up those who ought to go."

Assisting Export Trade

THE Department of Overseas Trade has issued an attractive little pamphlet about its aims and methods, and the work it is actually doing. If it is intended as an apologia for the Department at a time when demands are being made for the scrapping of unnecessary Government machinery, it should serve the purpose effectively. It shows that it is doing useful work on practical lines to assist British manufacturers and traders to extend their overseas trade, and the general experience of those who have to deal with the Department is that it does seriously set itself to promote and not to hamper trade development.

In a note which serves as a preface Mr. F. G. Kellaway, M.P., the Parliamentary Secretary for the Department, points out that the fiercest struggle for foreign trade since our merchant adventurers first set sail will soon engage the whole fabric of British industry. The more quickly we develop our export trade and so strengthen our exchanges the sooner we shall lighten the burden of taxation. Every trader, he states, will recognise at once the urgent necessity of knowing what his competitors are doing, how matters relating to overseas markets stand, and what are the conditions and prospects in them for our overseas trade. The individual initiative of the trader counts before everything else.

All this is excellent, but the trader may possibly retort that conditions more often hamper than encourage his initiative and enterprise. There is, for example, the question of shipping rates. Here the trader is almost wholly at the mercy of the shipping companies, and in some cases the insistence on *ad valorem* rates kills at its source any attempt to explore new markets. Mr. Kellaway speaks in the most appreciative terms of the services the trader has rendered in the building up of British world trade and emphasises the Department's wish to assist him in every way possible. We are not sure whether he uses the term in the trade sense of distributor, but in any case, it is satisfactory to have the assurance that no preferential treatment is made by the Department between the large and the small firm, between the manufacturer and the merchant. There is a suspicion—though probably inquiry would show that it is nothing more than suspicion—that the departmental attitude of late has been more favourable to the manufacturing than to the distributing interest. The Dyestuffs Bill rather lends to support this view, for as far as one can see the only interests it recognises are those of makers and consumers. At a time when trade development is so necessary to national welfare, it seems most unfortunate that sectional jealousies of this sort should be fostered. What is wanted is vigorous co-operation between maker and distributor to ensure the largest possible output and the largest possible consumption of British productions, and it is satisfactory to find one Department at once frankly supporting this policy.

Sulphuric Acid and Ammonia Oxidation

ONE of our subscribers to whom we were talking recently drew attention to the fact that, whereas some two years ago a great deal was heard of the elimination of the nitre pot in sulphuric acid plant and its replacement by the ammonia converter, to-day interest in

the matter seems to have entirely subsided, and the majority of sulphuric acid producers still continue to employ nitrate of soda. Perhaps, the main difficulty in connection with the ammonia converter is that it necessitates a supply of comparatively pure ammonia, and it is only the minority of acid works which have this ammonia available. The situation has been complicated, moreover, by the fact that the war demand for a special variety of pure concentrated ammonia has ceased, with the result that many plants erected for its manufacture are now shut down. Providing, however, that a source of ammonia is available there should be no difficulty in introducing the process, as has been demonstrated by Mr. Gordon Adam, who has operated, without the use of nitrate, several large acid plants under his care. The ammonia used in this case was the ordinary anhydrous product, testing at least 99.95 per cent., and, after a number of experiments with catalysts, it was eventually found that superimposed layers of pure platinum gauze gave the best results. Mr. Adam carried out numerous experiments to determine the minimum thickness of catalyst required in order to secure a maximum conversion of ammonia to oxides of nitrogen, and also to preclude the slip of ammonia. The latter consideration is of importance, for ammonia reacts with oxides of nitrogen to yield water, nitrogen, or nitrous oxide. Necessarily, therefore, any slip of ammonia through the catalyst gives rise to a diminished yield by reason of the intervention of secondary reactions which occur immediately the oxidation products leave the catalyst.

One writer on the subject has stated that those acid works managers who can so conduct and control the operation of their plants as to need only 0.4 lb. of ammonia per 100 lb. of the sulphur equivalent of the sulphuric acid produced will merit emulation. Unfortunately, the efficiency of the production of the nitrogen oxides, as such, in connection with chamber plants is unknown. Ninety-six per cent. yield is possible with an efficient type of independent nitric acid plant, but it is doubtful if this efficiency is capable of being uniformly maintained. On the other hand, with ammonia oxidation in its present stage of development the overall efficiency is probably about 85 per cent. It has been said that in conjunction with a large sulphuric acid plant that at least 30 per cent. saving may be effected with the converter as compared with the usual nitre pot method; but the whole question turns, of course, upon the relative market values of ammonia and nitrate of soda. It would certainly provide a long-felt want if some of those sulphuric acid manufacturers who have had experience with the ammonia converter would give their views as to the limiting values of ammonia and sodium nitrate which make the use of the oxidation process commercially profitable.

Two Classes of Advertisers

OUR comments of last week on successful advertising have attracted some notice and inquiry. It is not the editorial province to advise astute men of the world how to expand business and increase profits, but a note may be added on what we believe to be the secret of effective publicity. Advertisers may be broadly divided into two classes—those who do it thoroughly and well and those who do it spasmodically

and not so well. The latter are rather like the timid souls who viewed a certain flood, but feared to launch away. They try an odd announcement here and there, and carefully tabulate results to ascertain if they have received the expected ninepence for fourpence. Not infrequently, it must be confessed, they are a little disappointed. The fault, however, is not with advertising, but with their own unscientific use of it. Those mysterious oracles, the publicity experts, whose counsels even Governments now defer to, confidently tell us that the essence of successful advertising is the cumulative effect. It is not one great splash, but the continual dripping, that makes the desired impression. If anyone studies the productions of the great firms which regard advertising as one of their most important departments, they will see how the object is to build up a certain public opinion, which once established represents an enormous value in goodwill. And it is noteworthy that the firms which go in most largely for publicity are those which attain the largest proportions, and which are managed by the most alert minds. Such firms do not throw thousands of pounds away for the convenience of newspaper proprietors. If it did not pay, they would drop it. The fact that they continue to expend money on an increasingly liberal scale is the best proof that they find it remunerative expenditure.

The Calendar

Dec.	11	North of England Institute of Mining and Mechanical Engineers: General Meeting, 2 p.m.	Newcastle-on-Tyne.
	13	Royal Society of Arts: Second Cantor Lecture, Micro-Organisms and Some of their Industrial Uses," by A. Chaston Chapman, 8 p.m.	John Street, Adelphi, London.
	13	Chemical Industry Club: "Phosphorescence and Invisible Light," by Dr. W. R. Ormandy, 8 p.m.	2, Whitehall Court, London.
	13	Faraday Society: Annual General Meeting, 8 p.m. Ordinary Scientific Meeting, 8.15	Burlington House, Piccadilly, London.
	14	Royal Photographic Society of Great Britain: Technical Meeting under the control of the Scientific and Technical Group, 7 p.m.	35, Russell Square, London, W.C.
	14	Institution of Petroleum Technologists: "Drilling for Oil in Egypt and Mesopotamia," by Captain P. W. Mangin, 5.30 p.m.	Royal Society of Arts, John Street, Adelphi, London.
	16	Manchester Municipal College of Technology (Dept. of Applied Chemistry): "Acid Elevators," by B. Heastie, 6.30 p.m.	Manchester.
	16	Chemical Society: "Some Properties of Explosives," by Sir R. Robertson, 8 p.m.	Institution of Mechanical Engineers, Storey's Gate, London.
	21	Hull Chemical and Engineering Society: "Is a University-trained Man a Commercial Asset?" Debaters, H. Thompson, W. Geary.	The Metropole, West Street, Hull.
	23	Society of Dyers and Colourists (West Riding Section). M. Fort, M.Sc., F.I.C.	Yorkshire.

The Polymerisation of Fatty Oils (II)

The first part of this article was given in our last issue. In the concluding instalment the writer discusses further modifications effected by the polymerisation of oils and fats.

Voltol Oils

THE following table gives the more important characteristics of the volto oils used for mixing with mineral oils for the manufacture of lubricants, especially those used in place of castor oil for aircraft rotary engines. As is well known, castor oil had been found to be the best for this purpose, especially at high altitudes, owing to its low freezing point ; and it was not readily obtainable in Germany during the war, so that the volto oils were very largely used :—

Kind of oil.	Sp. gr.	Refraction index @ 15°.	Viscosity @ 100°.	Acid No.	Iodine No.	Mean mol. weight.
Rape voltol	0.9740	1.485	83.6	11.7	52	1200
Whale voltol	0.9819	1.485	74.9	15.4	51	1000

The high viscosity of the voltol oils is partly due to the formation of oxidation products and to intra-molecular polymerisation during the initial blowing, but chiefly due to the production of di-molecular glycerides under the influence of the electric discharge. The presence of such glycerides accounts for the molecular weights, 1,200 and 1,000 respectively, although they are not, of course, so high as that of very thickened linseed oil (lithographic varnish), which is in the neighbourhood of 1,755. The glycerides are dissolved as sols in the voltol oils, producing considerable thickening; but a portion ultimately separates out in gel form as a greyish-white fishy precipitate, which, when treated with acetone, appears as solid white glycerides insoluble in all solvents. A certain defect in the voltol oils first made was therefore the reduced viscosity on heating—i.e., in the case of a rape voltol after eight hours' heating, a reduction from 83·6 to 57, and in a whale voltol from 74·9 to 46. It was at first imagined that this was due to de-polymerisation, but further experiments undertaken at the request of the military authorities showed that the mol. wt., I.V. (iodine value or number), and the sp. gr. remained unchanged by heating, and therefore the reduced viscosity must be due to physical changes in the polymerisation products. It has recently been claimed that heat-resistant voltol oils are now manufactured.

Polymerisation also occurs spontaneously when fatty oils are in storage, accompanied by thickening, reduced I.V. and increased sp. gr. Molecular weight determinations of a very thick linseed oil stored for many years, also of thickened wood oil and cotton seed oil, show that the polym. is intra-molecular; but owing to oxidation taking place at the same time the mol. wts. are not higher, but actually a little lower than those of the original oils.

Effect of Temperature

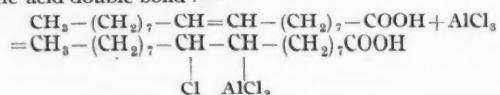
Summing up results so far obtained, it may be said that at room temperature or a little above, say, up to 120 deg., the maximum for air-blowing, the polym. is intra-mol., but at higher temperatures, between 200 deg. and 300 deg., it is bi-mol. In the manufacture of voltol oils temperature conditions are intermediate between these two. If, instead of being blown at 120 deg., the oil is blown at 200 deg. or over, double molecules are formed; for example, a seal oil blown at 230 deg. for seven hours had a mol. wt. of 1,200, as compared with its original 784. With continued blowing the mass gelled.

Polymerisation with Chemical Agents

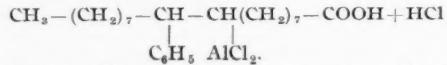
Experiments were undertaken to see if polym. of fatty oils could be obtained by using chemical agents—e.g., aluminium chloride or iron chloride. 10 g. of linseed oil were dissolved in 40 c.c. of benzol, and 3 g. of aluminium chloride gradually added. There was considerable heat with formation of hydrochloric acid, and after cooling the mixture was again heated over the water-bath. The reaction product was dissolved in ether, shaken up with hydrochloric acid to remove the aluminium salts, and then washed free of mineral acid. The result was a viscous oil of I.V. 120, sapon. No. 185, and acid No. 15.6. In glacial acetic acid the separated fatty acids had a mol. wt. of 360. When using seal oil the reaction proceeded more favourably; the I.V. was reduced from 141 to 44; the product was considerably thicker than that obtained from linseed oil; apparently the clupanodonic acid in the fish

oil reacted more readily than the linoleic acid; and there was no very great increase in the mol. wt. Some light was thrown on the course of the reaction by experiments in which unsaturated fatty acids were used instead of the glycerides. 20 g. of oleic acid (Kahlbaum's) were dissolved in five times the volume of benzol, and treated with 14 g. of aluminium chloride, and further dealt with as above described.

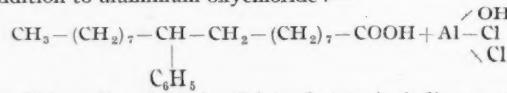
A thickened oil was obtained with I.V. 3.2, acid No. 167, and sapon., No. 169. The acetyl sapon. number was approximately the same as the sapon. number, so that oxy-groups were not apparently formed. The sp. gr. at 15 deg. was 0.945, and the refractive index 1.492. Inorganic constituents such as aluminium or chlorine were not found. The mol. wt. calculated from the acid number (167) was 335, but cryoscopically it was 358. Polym. therefore had not taken place, but a condensation product—phenyl-stearic acid—had been formed between the oleic acid and benzol, mixed with a small quantity of oleic acid. Phenylstearic acid has an acid number of 156, and a mol. wt. of 360. The first part of the reaction therefore consisted in the addition of aluminium chloride to the oleic acid double bond:—



In the second place the chlorine atom attached to the carbon atom changes places with the phenyl root, with formation of HCl :—



Finally by the addition of water phenylstearic acid is obtained in addition to aluminium oxychloride :—



The acid is easily soluble in all fat solvents, including acetone ; and its lead salts are soluble in ether like those of oleic acid. The acid may be purified by dissolving its lime salt in amyl alcohol.

Elaidic acid behaves in the same way as oleic acid, but the reaction in this case is easier and more complete. The reaction product has an I.V. of 2, but after redissolving the lime salt in amyl alcohol and again separating out the acid the I.V. is 1. The phenylstearic acid thus obtained from elaidic acid is identical with that from oleic acid. Erucic acid condenses with benzol to form phenylbehenic acid. Linoleic acid reacted much more readily than linseed oil. The crude condensation product had an acid number of 168.5, an I.V. of 26, and a mol. wt. (in glacial acetic acid) of 396. Clupanodonic acid also combined very readily with benzol. Instead of benzol its homologues—toluol and xylol—may be used, also naphthalene, anthracene, nitrobenzol, anisol, &c., in chloroform solution if necessary, and a fairly wide field is thus opened up for the preparation of new fatty aromatic compounds. These condensation products are for the most part viscous; in particular the compound of oleic acid with anthracene was very highly viscous. The condensed acids may be freed from excess hydrocarbon or substitution products thereof by blowing in steam or, where this is not possible, by treatment with lye, and removing the resulting soap solution with ether.

Acids whose carboxyl groups are adjacent to the double bond, such as normal crotonic acid and phenylacrylic acid (cinnamic acid), are not condensable and remain unchanged after treatment with aluminium chloride and hydrocarbon. These acids, however, have no iodine values, as Ponoic and Gastaldi have already shown.

In view of the tendency of benzol to favour condensation reactions further experiments were carried out in polymerising fatty oils with aluminium chloride in the presence of chloroform or carbon disulphide, the oils chosen being linseed oil, fish oils, and their fatty acids, including oleic. In every case the iodine value declined, but not to such an extent that a high

degree of polymerisation could be inferred therefrom. (See Table 3.)

Polymerisation of Oils and Fatty Acids with Aluminium Chloride

Oil or fatty acid.	Solvent used.	I.V. of the reaction product.
Linseed oil	Chloroform	169.0
Linseed oil	Carb. disulphide	165.0
Seal oil	Carb. disulphide	80.2
Linoleic acid	Chloroform	52.0
Whale oil fatty acid	Carb. disulphide	76.6
Oleic acid	Carb. tetrachloride	43.5

Chinese wood oil gives better results. Using a chloroform solution of this oil and aluminium chloride an insoluble gelatinous mass was formed, filling the whole vessel, after standing over night even at room temperature, but more quickly if heated over the water-bath. After treatment with hydrochloric acid a solid polymerised wood oil was obtained from this mass which was, however, by no means identical with that obtained from heated wood oil. On extraction in the Soxhlet only 15 to 20 per cent. oil was obtained, as compared with 40 to 80 per cent. from the heated product; it was completely soluble in acetone, and had an I.V. of 45 to 50., or practically the same as that of the fatty acids of the ether-insoluble gel, as compared with 86 with the heated product. In like manner the fatty acids of wood oil are polymerised with aluminium chloride, accompanied in the first place by gelatinisation. After decomposing with hydrochloric acid the brown viscous to white resinous oily polymerisation product had an acid no. of 165, a sapon no. of 194, an I.V. of 53, and a mol. wt. of 550. The reaction was the same whether benzol or chloroform was used as solvent. Obviously eleostearic acid is more readily polymerised than condensed. The reaction proceeds in a similar manner if iron chloride is used instead of aluminium chloride, but much more rapidly. The reaction product was decomposed with hydrochloric acid, washed, and then extracted with ether. The ether solution was again shaken up with water to remove any trace of iron chloride. Only 7 per cent. oil was obtained, and the fatty acids of the ether-insoluble gel had an I.V. 45.5. This reaction may be used for the approximate quantitative determination of wood oil in mixtures.

Neither linseed oil nor whale oil were precipitated (?) by iron chloride in ether- or benzene- or acetone-solution. But if the ether solution is heated in the presence of excess iron chloride then oxidation takes place. After distilling off the ether and treatment with benzene a solid dark-coloured glyceride is separated out which, after saponification, yields oxyacids insoluble in petroleum ether.

Polymerisation of Lindner's Yeast Fat

A particularly interesting case of polymerisation was that of yeastfat. The yeast culture, *Endomyces vernalis*, was grown by P. Lindner at the Fermentation Institute (Institut für Gärungsgewerbe), and the dried substance contained up to 50 per cent., but on an average 33 per cent. of fat, which was recognised under the microscope in the form of globules, and could thus be almost quantitatively estimated. The separation of the fat was at first difficult, and it could not be obtained by pressing or extraction, doubtless because the albuminous matter and carbohydrate closely enveloped the fat. After heating for a short time, however, with hydrochloric acid—which split up the albuminoids—the fat was easily set free and could be obtained in the usual manner. An oil was thus obtained in this manner from the dried fat-yeast, and had an acid no. 50, a sapon no. 106, a Hehner no. 86.7, and an I.V. 92, and contained about 13 per cent. solid fatty acids. When using fresh yeast containing up to 80 per cent. water the acid no. was only 12 and the I.V. 90. The characteristics, therefore, of this oil placed it intermediate between olive oil and cotton seed oil. The case was very different, however, when a dried yeast was tested in the presence of ordinary salt. The idea of using salt was to render the cell walls somewhat more brittle, and thus more easily broken in the grinding mill. It was found that some oil was obtained directly from milling, whilst subsequent extraction with ether produced an oil which was much more viscous than that obtained when no salt was used; the I.V. had fallen from 90 to 61, and the acid no. was 25. Under the action of ordinary salt, therefore, a considerable amount of polymerisation had occurred under the con-

ditions obtaining, e.g., presence of albuminoids, so that the use of this oil for edible purposes might not be advisable.

It is well known that, in ordinary fats, sterins and sterin ethers are found in addition to the glycerides, and these also undergo profound modification through polymerisation. For example, from a blown bone oil a thick oil was obtained as an unsaponifiable constituent, from which it was not possible to obtain cholesterin by recrystallisation. By cooling a benzene solution of the unsaponifiable down to -20° a solid substance was indeed obtained, but this showed a crystalline form very different from that of cholesterin.

From a cotton seed oil which had been thickened by many years standing some phytosterin was obtained by means of Bömer's method in addition to unsaponifiable oil; but, on the other hand, no sterin crystals could be obtained by heating a very thickened linseed oil (lithograph varnish). By treating the unsaponifiable oil (about 1.7 per cent.) with digitonin solution there was only slight precipitation, clearly proving that unchanged phytosterin was only present in quite small amount.

By reacting aluminium chloride with cholesterin in chloroform solution a yellowish brown resin was produced, easily soluble in ether and benzol, but only slightly soluble in glacial acetic acid and alcohol. This easy formation of a typical resin from cholesterin is the more interesting, since, according to Tschirch, the sterins are indispensable constituents in the formation of resins; and this appears to be confirmed by the latest researches in plant physiology.

**What the Dye Industry
Really Wants**

(From a Chemical Correspondent)

ONE reads with diminishing optimism the speeches and articles which appear from time to time in the Press on the position of the Chemical Industry in this country. Since the introduction of the Dyes Bill there have been further speeches and articles. They bear such a strong resemblance to those which appeared during the war that one wonders what has been done in the meantime.

There are many conclusions. Some say the chemists are all right. The ability is there they assure us. Indeed, the thing is done more or less, the impossible accomplished in an amazingly short space of time, but the commercial organisation is wanting. Others very strongly urge that the quality of the English chemist is still very low. Better chemists more highly trained, are required. If only we can get them (a mere matter of improved chemical education all round, of course) the dye industry of the world is practically at our feet, not to mention the Fine Chemical Trade.

Others are quite content providing only the Dyes Bill goes through. Give us protection they say and we will romp home. Germany cannot compete then, and that is all that is wanted. These three points of view are put forward by eminent men in the industry. Let me repeat them for clarity:—

A says it is not the chemical but the commercial side which is at fault.

B says better trained chemists are required.

C says everything is all right but the trade must be protected.

Of course, there are others, but you generally find their arguments are used in the articles written or the speeches made by Messrs. A, B, or C. For instance, there is the man who says that the Dye Industry cannot be a success unless the British consumers are prepared to buy and pay the extra price for the British article.

Now either A, B, or C must be wrong, because if they are all right the whole thing is hopeless. If only one is wrong it is bad enough, but if more than one is wrong then something greater than the Dyes Bill is necessary to make the Dye Industry a success in England. It will be well to examine the three opinions, for I personally think all three are wrong. A different point of view is required altogether.

Take Mr. A's attitude then. This is held by several who ask us to believe that it is impossible or so far has been impossible to find the right commercial knowledge necessary for the development of the Dye Industry. They say the success of

the German Industry lay in the perfect combination of Dr. Duisberg on the chemical side and Dr. von Böttigen on the Commercial. They say that we have in Dr. Levinstein the counter-part of Dr. Duisberg, but that there is no Dr. von Böttigen to sell his products so to speak. Poor old England! We have been a leading commercial country for many years, we have found men to build up industries in almost everything that can be named, and yet we cannot find a single man whose business ability is such that he can organise the commercial side of the Dye Industry. And the Industry is still looking for a Napoleon—not a chemical one, but a commercial one. It is not within the power of any man to organise a trade successfully against world competition if that trade cannot produce the articles to be marketed at as low a price as their competitors.

Mr. A suggests that the chemist is really all right, whereas Mr. B wants better chemists still, which is tantamount to saying that the existing chemist has not "got there." I think the evidence goes to show that he has not, but how could he in the time? I believe many of the problems have been solved, and we know that excellent dyes—better than pre-war German, we are assured—have been produced, but what is the use of such solutions if the work stops there, and the factory handling is so small or so feeble that the product cannot be produced cheaply enough? It is the old trouble—the English chemist can solve, but few of him can produce largely and cheaply. And there I am in agreement with Mr. B. We want chemists who can and who are trained to do so.

But Mr. C has a much easier solution, a solution which runs hand in hand with the plaint that the British consumer must be prepared to pay higher for the British goods. Mr. C. wants protection, and is going to get it. Others want the consumer to pay direct, I suppose, as he will pay any way under protection. Those who clamour for protection and pray that the conscience of the consumer may be touched so that he will gladly pay more for his raw material than he need are overlooking one fact. We want our Dye Industry, and indeed all our industries to compete in *all* the markets of the world. The home consumption is considerable, but it is not so large that a charming sacrificial act on the part of the English consumer such as is suggested would materially help us to compete in the other markets if our initial costs are too high. Suppose they agreed to do so. There is coming as sure as the night a very close-cropped competition all over the world in all goods. Suppose the dyers have to sell so low in order to hold, say their Eastern markets that the slightest increase in their costs must make a vast difference, and perhaps cut them out. Much good would the sacrificial act have done them or the Dye Industry.

Can We Produce as Cheaply as Germany?

It is no good talking about better chemists, or the lack of a sound commercial brain, or about protection either if it is established that dye-stuffs and many other chemicals cannot be produced as cheaply here as in Germany under existing conditions. The contributory reasons for the failure are many. It would be absurd to blame the chemist without calling attention to other sections which must fail. The whole point is—can dyestuffs be manufactured here as cheaply as they can in Germany? It is quite immaterial within limits whether the English dye-stuffs are better than the German or not. It is sufficient to know that the German pre-war dyes were very good, and even if capable of improvement were good enough and cheap.

I should be very sorry to hurt anyone's feelings, but there is no gainsaying the fact that a great deal of "hot air" has been talked about the dye industry and the chemical industry generally since the outbreak of war. It seems to be taken as an axiom of all discussions on the subject that because other countries can manufacture chemicals cheaply, we can. It does not follow. The same has been thought and said of other industries which to-day practically do not exist as far as manufacturing goes. The country which is supreme in some particular manufacture is so because it has one or more conditions peculiar to itself which are of paramount importance to the industry concerned. Even that is not always sufficient. A country may have a cheap raw material but be quite incapable of producing cheap products therefrom. It may have the ability to do so, and expensive labour, or the wrong climate, or even a foolish and short-sighted Government!

The calm way in which we talk as if England has a sort of Divine right to the first place in manufacture is as dangerous as it is foolish. It was not so before the war, particularly in

the chemical trade. Why should it be so now? Are we more gifted than then, or are our conditions for manufacture any better? We have simply hoped, and many of us believed for a long time that our ability to succeed in the Dye Industry was there, and that the war provided the change required to give that ability scope and opportunity.

There are enough sane men in the Chemical Industry of this country in all conscience, and I should like to see them gather together and discuss one question—"Can the English Dye and Fine Chemical Industry compete with Germany without artificial assistance?" I have no doubt that the answer would be in the negative.

Let us assume I am right. It would mean that as far as the Fine Chemical Trade is concerned we should rapidly return as we are now doing, to pre-war conditions, under which the so-called Fine Chemical manufacturer is more merchant than manufacturer. He will still have his factory and run certain lines, but for the rest he will import and re-sell under his own name. Only a tremendous combination could stop it.

But what of the Dye Industry? A huge capital is involved there, and it would seem certain, if my contention is true, that the industry will be lost to the country after all. That is perhaps going too far, but it is certain at present that with all the ability employed in the industry Synthetic Dyes cannot be manufactured as cheaply here as in Germany. Neither protection nor heaven-born chemists nor great commercial organisers can do it yet.

The trade asks for time. The war respite has been too short. German dyes are coming back cheap, and the trade has to confess that it cannot meet the competition. It asks for time by way of a protective measure. Again, I would point out that protection only affects the home trade and does not affect the foreign markets except in an indirect way.

I suggest that in the arguments put forward by the Government advocates of the Protective measure there is a hidden suggestion that might be acted upon. The Government says that the Dye Industry must be supported. It is not only a key industry, so they say, but it is an essential part of our war measures. In other words, the country after a bitter war experience now knows that it must have a dye industry in its midst as a going concern, or its state at the beginning of the next war will be nearly as bad as at the beginning of this one. It has required this great war to bring home to the minds of our Government offices that the means of supply of munitions is as essential—if not a little more so—as the War Office itself!

The Dye Trade wants time. Then let the Government make itself responsible for its losses, and even guarantee a minimum dividend on the understanding that when necessary its products shall be sold at the same price or lower if needs be as the German article. Let this be done for ten years as a war measure and at the end of that time if there is not the improvement or the complete success that is anticipated, let the Government take over the industry as a Government undertaking on the ground that it is necessary for the protection of the country.

After all what good is a protective measure to the Industry or to the country? It does not help the trade materially to get into the foreign markets. It tends indeed to keep it out, because of reprisals. It penalises the consumers of the dyes—a vast and quite as important a key industry, and gives a false impression of success to an industry which can only succeed if it can produce as cheaply as its competitors. Give the trade the chance by all means to make good. Let those who are in control and believe that they can do it prove that they can. Help them to, but not by a measure of protection which will—

- (a) Penalise other trades.
- (b) Prevent purchase from Germany by those whose legitimate business it is to so purchase.
- (c) Cause discontent in other trades.
- (d) Give a sense of security to the trade which is false.
- (e) Encourage a final collapse much more humiliating than the arrangement suggested.

After all, except that the business was done through the Banks, it was just what is suggested that was done in Germany before the war. They made good, but they did so only because they knew that if they had to make sacrifices in order to keep a market, the banks would stand by them until better times came and they could put their prices up or produce more cheaply. The English Government must understand this too, and if they want a dye industry as a munitions measure give it a healthy, not an unhealthy, chance to make good.

The New Dyestuffs Bill

WE give below the text of the new Dyestuffs Bill:—

1. (1) With a view to the safeguarding of the dye-making industry, the importation into the United Kingdom of the following goods, that is to say, all synthetic organic dyestuffs, colours and colouring matters, and all organic intermediate products used in the manufacture of any such dyestuffs, colours, or colouring matters shall be prohibited.

(2) Goods prohibited to be imported by virtue of this Act shall be deemed to be included among the goods enumerated and described in the Table of Prohibitions and Restrictions Inwards contained in section 42 of the Customs Consolidation Act, 1876, and the provisions of that Act and of any Act amending or extending that Act shall apply accordingly.

2. (1) The Board of Trade have power by licence to authorise, either generally or in any particular case, the importation of any of the goods, or any class or description of the goods, prohibited to be imported by virtue of this Act.

(2) For the purpose of advising them with respect to the granting of licences the Board shall constitute a committee consisting of five persons concerned in the trades in which goods of the class prohibited to be imported by this Act are used, three persons concerned in the manufacture of such goods, and three other persons not directly concerned as aforesaid.

Such one of the three last-mentioned persons as the Board shall appoint shall be chairman of the committee.

(3) For the purpose of providing for the expenses incurred by the Board in carrying this Act into execution, the Board may charge in respect of a licence a fee not exceeding five pounds.

3. Subject to compliance with such conditions as to security for the re-exportation of the goods as the Commissioners of Customs and Excise may impose this Act shall not apply to goods imported for exportation after transit through the United Kingdom or by way of transhipment.

4. Anything authorised under this Act to be done by the Board of Trade may be done by the President or a Secretary or Assistant Secretary of the Board or by any person authorised in that behalf by the President of the Board.

5. (1) The provisions of this Act shall continue in force for a period of ten years from the commencement thereof and no longer.

(2) This Act may be cited as the Dyestuffs (Import Regulation) Act, 1920.

Bill Read a Second Time

Government Majority of 205

SIR R. HORNE moved the second reading of the Dyestuffs (Import Regulations) Bill on Tuesday. After defining its objects he reminded the House that at the outbreak of war we were importing something like £2,000,000 worth of dyes every year, and upon that supply the textile industry was dependent. The textile industry, threatened with disaster, asked for Government assistance. The Government lent money, established companies, and gave pledges upon which they could not go back. The arguments upon which the setting up of the British Dyestuffs Corporation rested was that we should get rid of our dependence upon outside sources of supply. But during the war they discovered that the country which had a large dye-making industry within its borders had a very powerful agent for the winning of the war, as all the substances utilised in the making of dyes could be turned to the making of explosives.

There was before the Legislature in the United States a Bill, under which they should have prohibition, and licences granted only on the terms of existing tariff, which amounted to 30 per cent. of *ad valorem* duty on finished dyestuffs, together with a specific duty of 5 c. on the pound. The United States, which before the war was dependent on Germany to a very large extent, was building up a very great industry, and was amalgamating five of the biggest concerns in America, with a capital of something like £60,000,000. It was perfectly plain, therefore, that the United States were not going to allow themselves to be dependent upon outside sources for a commodity which they realised was vital not merely for the industry of the country, but even for its security.

Sir R. Horne referred to a motion on the Paper that the Bill be read a second time that day three months. He

agreed that there were other industries to be dealt with, and gave the assurance that they would be dealt with at the earliest possible moment. The case of dyes was really special, not merely because of the very great delicacy in the conditions of the industry, but also because of the fact that very special pledges were given by the Government of the day with the consent and acquiescence of the House of Commons, to the shareholders who subscribed to the British Dyestuffs Corporation.

Profits for Dividends or Research

Major Barnes, opposing the Bill, said that if the Government would revert to the original position of making this company what it formerly was—a co-operative company of colour users whose main and principal object was to produce the largest amount of dyes of the best quality and at the lowest price, irrespective of dividend—they might secure some measure of support for this Bill. This Bill would enable the British Dyestuffs Corporation to make fabulous profits, and what guarantee had they that that money would be spent upon scientific research, instead of being paid out in dividends? He concluded by moving the following motion: "That this House declines to give a second reading to a Bill which, under the pretext of providing for national defence, reintroduces the vicious Protectionist system of prohibition and licences, which will inflict grave injury upon textile industries of the country."

Mr. Asquith said he did not feel justified in voting against the second reading of the Bill. He wanted to impress on the Government that there was no question of the abstract controversy between Free Trade and Protection. The question was, What was the method, with the least inconvenience, by which they could safeguard an important national industry? Protection had nothing to do with the success of the Germans.

Sir P. Magnus said it was largely due to the enormous subsidies which the German Government gave to research.

Mr. T. Shaw said the debate was the most humiliating to which he had ever listened in relation to the British Government and nation. There was not a word in the Bill which would help to develop in this country the qualities which made Germany the greatest dye-producing nation. No protection for consumers was provided. The licensing system would be worked by a bureaucracy, and would offer a temptation to favouritism. If the dye trade was a key industry and was necessary for the defence of the Empire, the nation should take it over, manufacture the minimum quantity required, and enter into research in its works and universities.

The amendment for the rejection of the Bill was lost by a majority of 205. The second reading was then agreed to. A motion to commit the Bill to a Committee of the whole House was rejected.

Alkalinity of Commercial Soaps

At a meeting of the Bristol Branch of the Society of Chemical Industry last week a paper on "The Alkalinity of Commercial Soaps in relation to their action on the skin" was read. The paper was prepared by Messrs. F. C. Beedle and T. R. Bolam. Mr. Ernest Walls, president of the section, presided. A collection representing the various chemical industries of the City of Bristol was exhibited in the lecture theatres of University College, where the meeting took place. Heavy and other oils were shown by William Butler & Co.; a number of bases used in the manufacture of dyes, paints, printing inks, linoleum, &c., represented John Hare & Co., who also had some specimens of the finished article; products and by-products of the Bristol Gas Company were exhibited; Christopher Thomas & Co. exhibited soap and candles and materials used in their factories, also by-products; Capper Pass & Sons were represented by metal and metal alloys; John Cox & Co.'s successors showed leather products and chemicals used in making leather, as well as a lot of by-products. S. Wills & Co., the Bristol Refining Co., Ltd., Henry Pritchard & Co., Ltd., St. Anne's Board Mill Co., Ltd., Evans, Gadd & Co., Ltd., Ferris & Co., Ltd., James Rudman, Purnell & Panter, Ltd., P. and S. Evans & Co., Ltd., and the United Alkali Co., Ltd., all had collections of "goods" representing their various enterprises.

K. H. Kabbur & Co. announce that they have removed their offices and laboratories to larger premises at 25, Brazenose-street, Manchester. Their warehouse address remains unaltered.

Centrifugal Extractors and Separators Applied to the Chemical Industry

By F. J. Broadbent, M.Sc. (Bristol), B.Sc. (London), A.M.I.C.E.

We publish below the substance of an interesting lecture on "Centrifugal Extractors and Separators Applied to the Chemical Industry," delivered on Thursday, December 2, at the Manchester Municipal College of Technology, by Dr. F. J. Broadbent (Thomas Broadbent & Sons, Ltd.), Huddersfield, with a selection from the illustrations which accompanied the lecture

Introductory

If water be placed in an open can and the can be swung in a vertical plane in such a way that the can is upside down in the top position, it is found that at moderate speed the water remains in the can and does not fall out. This is not because the time is too short to allow of such a fall, for if a tap be opened at the bottom of the can water issues upwards from this when the can is in its highest position. This is a simple example of centrifugal force. It will be readily understood that the quicker the speed of rotation the more quickly does water come through the tap. All hydro-extractors which expel liquids through openings in a rotating cage or drum apply this simple principle. There are far more large hydro-extractors built and used of this form than of all other forms put together.

Chemist's and Engineer's Point of View

The chemist and the engineer approach the problem of the hydro-extractor from different points of view. A failure to recognise them may result in a chemist asking for a hydro-extractor to perform quite impossible tasks, and on the other hand in an engineer supplying a hydro-extractor which is afterwards found to be unsuitable. This is particularly likely to occur where a chemist is developing a new and secret process. In his anxiety to prevent information leaking out he gives the engineer the scantiest of information and is then liable to be disappointed at the result. In such cases there is a very simple remedy. The chemist should choose a firm of hydro-extractor makers of repute and give the fullest information.

In dealing with any problem of hydro-extracting the chemist will, amongst other matters, be concerned with :-

- (a) The quantity of material to be dealt with per hour.
- (b) The labour required to deal with this quantity.
- (c) The initial outlay on the plant.
- (d) The running costs.
- (e) The power required to drive the machine.
- (f) The quality of the resultant products.
- (g) The resistance of the various parts of the hydro-extractor to any chemical action.
- (h) Freedom from breakdowns and reliability of running.
- (i) Simple and clean system of lubrication.
- (j) Absence of complication of handles &c., for running the machine.

The chemist will always have the above in mind and in addition may have special problems to be solved.

The engineer in the design must endeavour to satisfy the whole of the above points and will have to consider :-

- (a) The strength and accessibility of the various parts of the machines.
- (b) Balancing of rotating parts.
- (c) Protection of all wearing parts.
- (d) Efficiency of drive.
- (e) Safety devices and brakes.
- (f) Provision for dealing with loading, discharge and effluents.
- (g) Methods of taking up the inevitable vibrations.
- (h) Drainage and foundations.

Hydro-Extractors for Sulphate of Ammonia

It is the chemist's points we are now considering. Let us examine this in connection with hydro-extractors for dealing with sulphate of ammonia.

The last stage in the manufacture of sulphate of ammonia is drying off by means of a hydro-extractor. The liquid in the salt may be slightly acid before reaching the extractor, or it may have been neutralized before reaching it. It is essential for the engineer to know which process is to be used

because it will affect his design. If the liquid is slightly acid it will rapidly corrode iron and steel. Hence for this case the cage—as the rotating part is called—must be made of acid-resisting material and the best for the purpose is probably copper. Moreover, since the dried sulphate is a powder something like salt, the perforations in the cage must either be very small or an inner lining of copper gauze must be used. The former is less troublesome, but may have the defect of retarding the drying process. Each has its advocates.

Again, the outer casing, or "pan" as it is called, in which the cage rotates and where the extracted liquid is collected and discharged must fulfil two important conditions. First, it must be acid proof, and for this purpose it is usually lined with lead. Second, it must be strong because copper, of which the cage is made, is not very strong metal, and moreover is slowly corroded by the acid, so that after some years of working, and if neglected, there is a possibility of the cage bursting. The outer casing should, therefore, be of steel and not of cast iron.

Then we have to consider how to load and to discharge the cage. The former may be done by shoots or tilting buckets running on an overhead runway and tilted over the hydro. This is hardly within the scope of our subject, but for unloading, the design of the hydro is important. It is clear that if the sulphate has to be lifted out over the lip of the cage, the cost and difficulty of labour will be very great, and that the only economical plan is to discharge it through openings in the bottom of the cage and the pan. Hence we have a "bottom discharge" hydro-extractor, but this involves a further point. The hydro must be raised up some height above the floor, so that the discharge may be made into some barrows or something similar or on to the floor below through a shoot.

If the machine is on a raised platform this may be done, though because of vibrations set up by the rotating loaded cage and the necessity of not transmitting these to the building, the hydro should be either of the "suspended" or "Weston" type. The former applies to "under-driven" machines where the driving power is applied underneath the cage and the bearings are rigidly fixed in the pan. Thus, though the cage can rotate in the pan, it cannot in any other way alter its position with respect to it. Hence, if the cage oscillates due to an uneven load the pan must oscillate with it, and for this reason the pan is suspended on three swinging rods which allow it to swing and so prevent great forces being transmitted to the foundation which otherwise would need to be very massive.

In this type of hydro-extractor a considerable space near the centre of the cage and pan is taken up by the machine itself, because for constructional reasons provision has to be made for a central bearing near the level of the top of the cage. It follows therefore that the bottom discharge must be made in the cage at some little distance from the centre, and for this purpose two or four openings, with doors, are made in the bottom of the cage. These are brought in turn opposite the opening in the bottom of the pan and the dried salt is then shovelled through.

The "Weston" Type of Machine

In the "Weston" type of machine the drive is transmitted from above, through a vertical shaft hanging downwards. The bearing of this shaft is above the machine, and is "housed" in such a way that it allows the whole cage to swing with the driving shaft just like a pendulum. This allows the cage to take up the necessary position for an uneven load, and if the housing buffer is properly designed the swings of the cage, which exist at low speeds, die out before they become too violent. It sometimes happens with some forms of elastic

support for the housings that after being in use for some considerable time, say one or two years, the swinging is not properly damped, and the oscillations become serious. In all such cases the buffer should be renewed without delay. It is because of this that special attention has been given by engineers to this upper housing, and in one form the support is on a spherical metal seat with a rubber buffer for damping oscillation only, and not for taking the heavy weight of the rotating loaded cage. This is instead of the conoidal rubber buffer which serves the double purpose of damping oscillations and supporting the cage in the simplest possible way. In this type of hydro the discharge is from openings very near the centre of the cage, and at the centre of the pan, since the rotation is transmitted to the cage through arms much like the spokes of a wheel, and the discharge can be made through the openings between these arms. Hence this type of machine is sometimes called "central bottom discharge."

The braking arrangements need not detain us. It is perhaps worth noting that with the under-driven type of machine it is usual to put the brake on the cage thus causing no stress in the driving spindle, but that this is impossible in the Weston type owing to the swinging cage and the brake must in this case be applied near the top housing. As braking causes a much more severe twisting effort than driving, the driving shaft for this case has to be considerably stronger than necessary for the drive only.

Figures of Performance

Now if the sulphate is neutralised before passing into the hydro, a black steel cage may be used. This is cheaper and stronger than copper, but even with neutralised sulphate slow corrosion appears to take place, and it is advisable to use a lead-lined pan. The following figures of performance are taken from actual practice. They refer to a 48 in. diameter cage. Each charge weighed about 3 cwt. About seven charges were made in two hours. The extracting was carried out by rotating at full speed for two minutes. Life of gauze six months, and of cage five years. The moisture in the finished product amounted to just over 2 per cent., and the ammonia to 25 per cent. The speed of rotation would be about 900 per minute.

The labour required to work the above hydro would be two men, one occupied at the filling, and the other at the discharging end of the hydro. They would also be responsible for cleaning out the machine which should be carried out very frequently. About 4 H.P. is ample for driving such a hydro. The problem of hydro-extracting sulphate of ammonia has been dealt with at some length, because it is absolutely typical of a great number of chemical problems with which the hydro-extractor can deal.

Drying of Finer Material

Let us next consider a similar problem, but involving certain further difficulties. This relates to drying a material having a specified gravity of 1.15, and which is much finer when dried than sulphate of ammonia. Gauze, therefore, is not sufficiently fine to prevent this material from passing through, so that a gauze is placed immediately against the side of the cage to support a filter cloth, and this in turn is protected by another gauze in front of it three thicknesses in all. The machine in which the substance is treated has a cage 72 in. diameter, and like the sulphate of ammonia machine is provided with a bottom discharge arrangement. The material before treatment is in the form of a slurry, and is fed when rotation is at full speed. The process is a long one, and only six charges of 700 lbs. each can be made in a day of 20 hours. The surface moisture is reduced to 2 per cent. Such a machine is used for six days per week, and as the product is valuable you will readily realise the importance of the engineer providing a sound, simple, reliable article.

A very interesting feature about this machine is the slow-speed rotation gear and scraper. We are not considering drives, as that is reserved for another lecture, but it may be mentioned that this machine is electrically driven and that the slow speed (40 per minute) is obtained by an auxiliary motor driving on a toothed rack under the cage and so arranged as to come out of gear automatically if the main drive is started up. The scraping gear is hand-operated, can be moved radially or vertically and is very satisfactory for this

powdery material, removing it from the sides at the slow speed and so easing the labour of discharge, but such a scraping gear might easily prove valueless if the character of the material is altered slightly, as, for example, if it becomes of a pulpy nature.

A further point is worth noting before leaving this machine, and that is that for such a size as this no maker would venture to make the Weston type of hydro-extractor. The risk of dangerous swinging would be too serious. We may take it as a general rule that above 48 in. diameter of cage two fixed bearings are necessary.

Large or Small Machines

That brings us to consider another matter. What is the drying effect of a large machine as compared with a small one? Instead of answering this question directly let us see what outward pull is given by a pound weight rotating at different speeds and different radii. This will give us a means of making comparison because it is this kind of force which causes moisture to leave the material to be dried.

If

N = revolutions per minute,

D = diameter of path in inches.

$$\text{The force becomes } \frac{1.42}{100,000} N^2 D$$

Thus, for a 42 in. machine rotating at 1,000 revs. per min., this becomes

$$\text{Centrifugal force in lbs. for 1 lb.} = \frac{1.42 \times 1,000^2}{100,000} \times 42 \\ = 596 \text{ lb.}$$

or, put in another way, the force exerted is 596 times the weight, that is, the gravitational force. Hence the term that the action of a centrifugal machine causes a force equal to so many gravities. The values have been tabulated and may be found in the *Mechanical World Pocket Book*. We will just glance at one or two of the figures for actual machines of the kind we are considering.

Diameter of Hydro Cage.	Revolutions per min.	Gravities.
9 in.	2,200	618
18 in.	1,500	575
26 in.	1,200	532
30 in.	1,150	501
36 in.	1,100	618
42 in.	1,000	596
48 in.	950	614
54 in.	850	552
60 in.	750	478
72 in.	650	431

From the above it will be seen that the drying effort is less with large-sized machines for practicable speeds, but this is not necessarily a defect because the drying may still be quite sufficient. In some cases—for example, low-grade sugars—the centrifugal action would need to be kept lower than the least of the values given in the table.

Modifications

It will be appreciated that the kind of extractor with which we have been dealing is capable of many modifications. If it is required to deal with fabrics, for instance, a bottom discharge is unnecessary; for some substances the process must be carried out at a high temperature so that steam coils or a steam-jacketed pan must be used. The slide shows a modification in which dangerous or explosive gases are given off. There is a gas-tight lid and a special water seal which allows the hydro-extractor to oscillate freely, but nevertheless, prevents any leakage of gas.

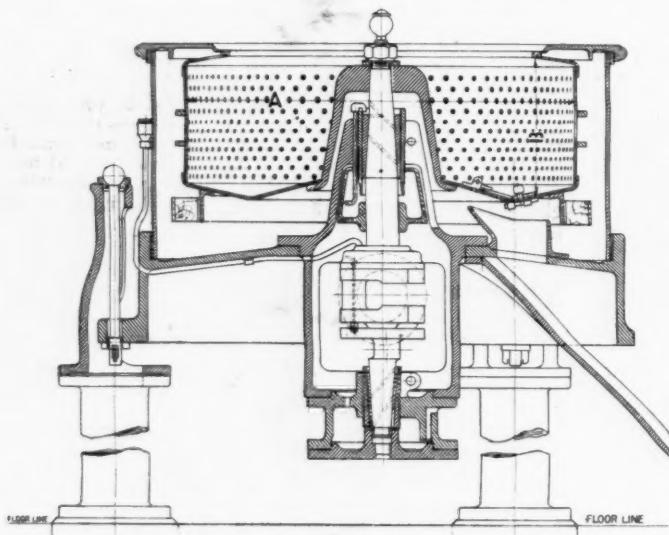
Acid-Resisting Material for Cages

Attention has been drawn already to the necessity of using some acid-resisting material in certain circumstances for the construction of cages. There are two possible plans. One is to choose a metal such as copper or monel metal which has high acid-resisting properties and the other is to coat a steel cage with acid-resisting material. Unless temperatures are high, say, over 90°C., and unless the cage is subjected to severe handling, the best method of coating is with vulcanite. There is one possibility of defect with a vulcanite cage. Even a fine

perforation through the vulcanite to the metal will admit acid which will cause corrosion of the metal behind the vulcanite without any external indication of this. There is, however, an electrical test which amounts to an insulation test and is carried out at 2,000 volts. By a special apparatus this test is easily applied to every portion of the cage and should be insisted upon by every buyer of a vulcanite cage to be used with weak acids. If, however, the cage is to be used merely for cleanliness—a very important use—and no acid is present, the test may be dispensed with. It is also worth having a vulcanite cage tested electrically annually to detect any flaw which may have arisen during use.

Separating Liquid and Solid

In dealing with some chemical substances in which separation between a liquid and solid is required, the method described for sulphate of ammonia is not applicable, because the solid portion is of such a nature that it rapidly forms an impervious layer through which the liquid is unable to pass. This necessitates a solid or imperforate rotating cage, *i.e.*, one without perforations on which solids are deposited and some means of discharging the liquid which collects on the inner surface of the solids. Considerable attention has been paid to this problem in recent years. The first feature we notice is that there must be a number of radial baffle plates. These serve the purpose of causing the



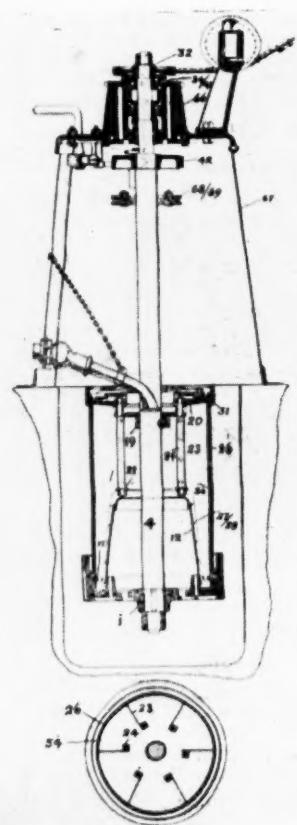
BROADBENT STEAM-DRIVEN BOTTOM DISCHARGE CENTRIFUGE.

liquid to rotate at the same angular speed as the cage, and also to prevent the development of bad vibrations, which are familiar to everyone who has experimented with imperforate cages with liquids. The feed is through a funnel and pipe leading to the bottom of the cage underneath a horizontal plate rotating with the cage and having a space at the back near the cage periphery, through which the feed must pass. Thus all the material fed into the cage is forced to pass near the cage shell and any heavy solids are deposited against this shell and do not return. A similar horizontal plate to the lower one is secured near the top of the cage and its lip extends rather nearer to the centre than the actual top lip of the cage. An adjustable skimmer pipe is attached to the pan top and so arranged that its cage faces the direction of motion of the rotating liquid. As this pipe is slowly introduced into the liquid the latter is discharged through it. In this machine, part of the liquid from which the solids have been extracted is discharged over the upper lip, but there is a lighter liquid which builds up on the lower side of the top plate and is finally skimmed off. It is used for recovering part of the grease from the liquid, which contains a small amount of solid matter. When the solid matter has built up a sufficiently thick layer the machine is stopped, the solid is removed and the machine is cleaned for a fresh start.

The Gee Machine

The modifications of this machine are worth further consideration. The first is the "Gee" machine. This machine is used for extracting and grading fine solids from a liquid and for filtration of the liquid. The imperforate rotating cage carries six removable internal plates, on which the solids are deposited. The filtration is performed by an inward flow of the liquid, so that choking of the filtering medium does not take place, owing to the centrifugal action forcing the solids in an outward direction. Moreover, fine filtering mediums can be used, since they are held in position by centrifugal force.

The feed is supplied by a pipe near the driving shaft and passes over a distributor plate. This operation is carried out whilst the machine is working. The centrifuging takes place in a pit and, when complete, the machine is stopped, the plates with the deposited solid are hoisted up and lifted away by men. This machine also grades the solids by the rate



THE GEE MACHINE.

of flow, and the finest solids are near the bottom of the plates, the heavier being above, so that they can be readily separated by horizontal cuts. Like all the machines hitherto considered, this is still an intermittent action machine.

In the Sturgeon type of machine we have a machine designed to carry out the same purpose as the Gee, with the exception of filtration, but with the additional point of being continuous in action. In order to secure this, the great pressures generated by water in rotation, as in a centrifugal pump, are used to discharge the treated contents of the cage.

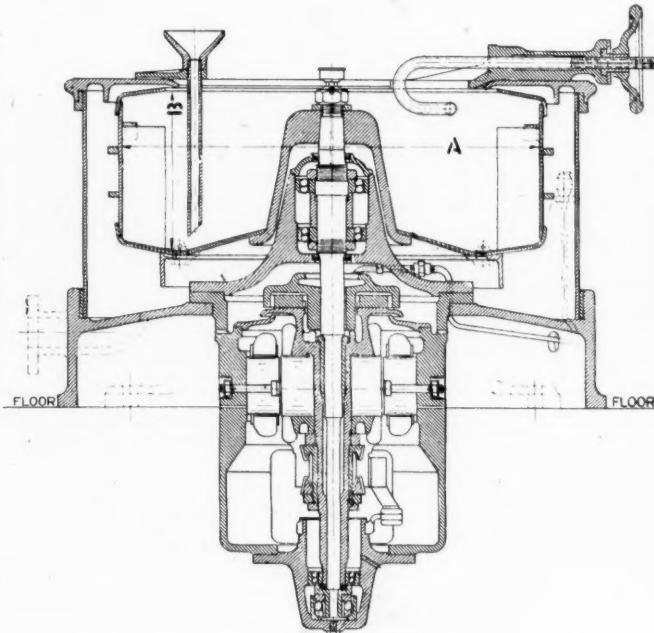
Application of the Continuous Principle

In separating liquids of different specific gravities, the continuous principle becomes readily applicable, but the application is different from that of the machines already considered. Without entering into the theory, it may be stated that if

Mixture of two liquids of different specific gravities be applied near the centre of the rotating imperforate drum and a horizontal dividing plate be used, such that any liquid passing to the top of the drum must pass near the outer periphery, then, by collecting the upper portion from openings further from the centre of rotation than the openings for collecting from the lower portion, the liquids will be found to have separated out, the heavier one discharging from the upper openings.

Another important feature is a number of thin perforated plates placed near one another. These have the effect of preventing eddies and of causing a dragging action on the liquid moving near them and add considerably to the efficiency of the separation. This kind of machine, together with others which we shall consider, are all much smaller in diameter than any of the previous types, and due to this it is possible to obtain much higher speeds proportionally and, therefore, a much greater centrifugal action than in the larger machines. At first sight, this is now obvious, but when it is realised that the stress in the rotating shell is proportional to the square of the revolutions multiplied by the square of the diameter, and, as stated previously, the centrifugal action on loose

of swing will be readily appreciated. With the smaller machine it is stated that sub-microscopic particles can be removed and such difficult separations as that of serum from blood can be efficiently performed. The passages through which the liquids flow are necessarily small in machines of this type and with even very small quantities of particles of certain kinds of solids these passages soon choke. In such cases a very excellent plan, which has been patented by a firm in this country, is to use a much larger imperforate hydro-extractor, as previously described in this lecture, first as a roughing machine. This will remove a considerable quantity of fine solid particles and also part of the liquid to be recovered and the remaining liquid is then treated in the Sharples Super-machine. In this way it was found that instead of cleaning the Sharples bowl every hour it was only necessary to clean every 24 hours and although it is not a difficult matter to do



BROADBENT ELECTRICALLY-DRIVEN CENTRIFUGE FOR SEPARATING LIQUIDS OF DIFFERENT SPECIFIC GRAVITIES AND FOR PRECIPITATING FINE SOLIDS IN SUSPENSION FROM LIQUIDS.

material is proportional to the square of the revolutions multiplied by the diameter; then, for equal shell stresses, the centrifugal action on the materials varies inversely as the diameter, but in addition to this, rotating drums of small diameter can be made from special unwelded steels, and hence, the shell stress, and therefore the speed of rotation, can be greatly increased above the corresponding ones for larger machines.

Sharples Super-Centrifuge

In the Sharples Super-Centrifuge the rotating drum is 4 inches diameter and the speed 17,000 revs. per min. Applying the formula we find this gives a centrifugal effect of 16,400 times gravity. Comparing this with an ordinary 36-inch hydro-extractor we see that the effect is 26.6 times as great. In the 2-inch diameter machine the speed is 40,000 revs. per minute, giving a centrifugal effect 45,400 times gravity.

It is claimed, with apparent justification, that these are the highest values of centrifugal force used in practice. The care required to balance such machines and to allow flexibility



BROADBENT ANALYTICAL CENTRIFUGE FOR PRE-DETERMINING THE NATURE OF LIQUIDS.

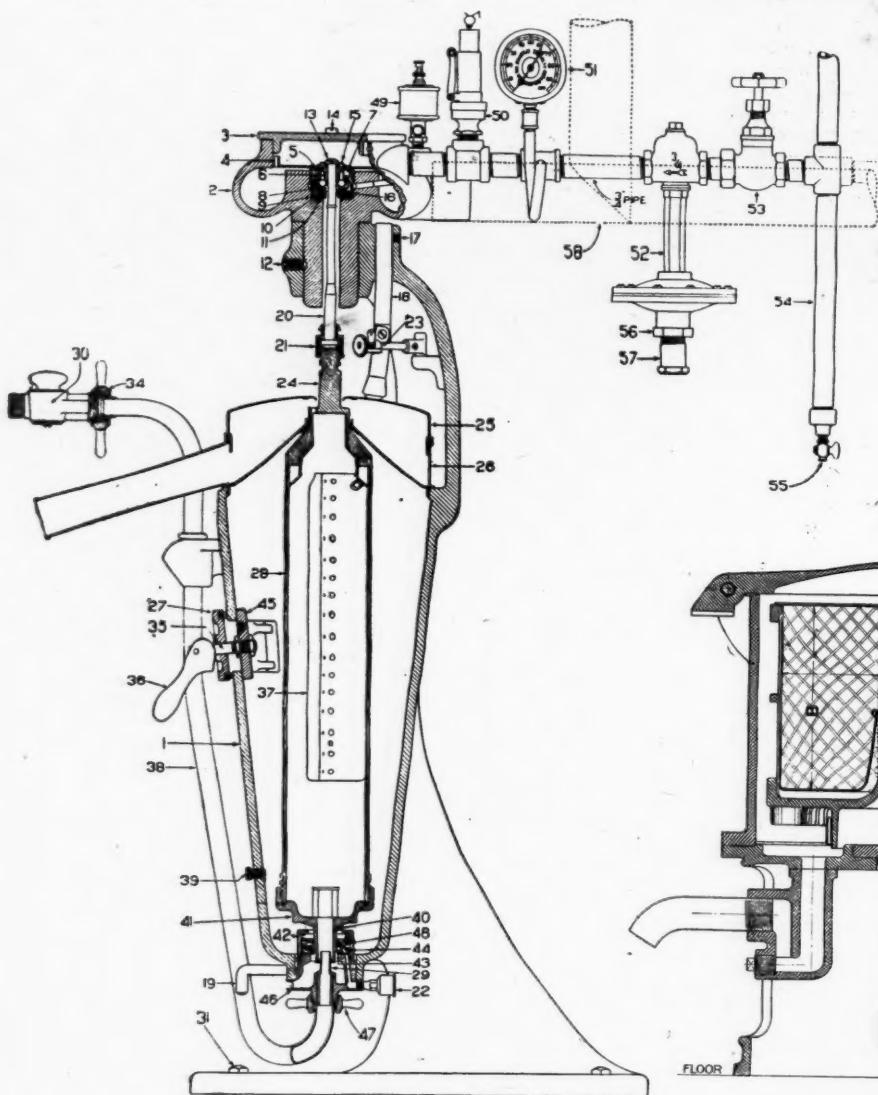
this and a spare bowl can be re-fitted in five minutes, yet in the case mentioned the two machines made all the difference between a commercial success and a commercial failure.

Of course there are very many applications in which the above difficulty would not occur. The case of separations of liquids of small difference of specific gravity will occur to everyone and an ingenious method of continuously discharging solids by means of a carrier of liquid of greater specific gravity than that in which the solids are suspended, has been developed. An example is the continuous separation from mineral oil of the wax contained therein. How far this is successful I am unable to say.

The De Laval Centrifugals work on the same principle as the Sharples Super-Centrifuge, but are larger in diameter and rotate at a lower speed. The force exerted is 6,000 gravities and the speeds 6,000 to 8,000 revs. per minute depending on the size.

There are three general types of machines, namely, the No. 200, with a capacity of dealing with from 8 to 36 gallons of liquid per hour, the No. 300 machine, dealing with from 90 to 120 gallons of liquid per hour, and the No. 600 machine, dealing with from 150 to 350 gallons of liquid per hour. It should be borne in mind that these figures relate to the amount of liquid which is fed into the machine and not to the results, which are, of course, dependent upon the viscosity of the liquid to be treated and the amount of impurities which it contains and which it is desired to remove.

One of the great uses to which these machines are put



SHARPLES SUPER-CENTRIFUGE FOR SEPARATION AND CLARIFICATION OF LIQUIDS.

is the purification of oil. The mechanical details are carefully designed and manufactured, but it will be noticed that there are three discharge covers and openings instead of the two only as seen in the other machines we have considered. The third is known as the overflow cover.

If at any time the bowl should become clogged by a large amount of dirt so that the liquid can no longer flow through, the inlet tube fills up and overflows into this cover. This keeps the overflow separate and acts as a warning signal that the bowl needs cleaning. At the top is the regulating cover into which the liquid to be treated flows before it passes into the bowl.

The rotating bowl has perforated discs and the internal

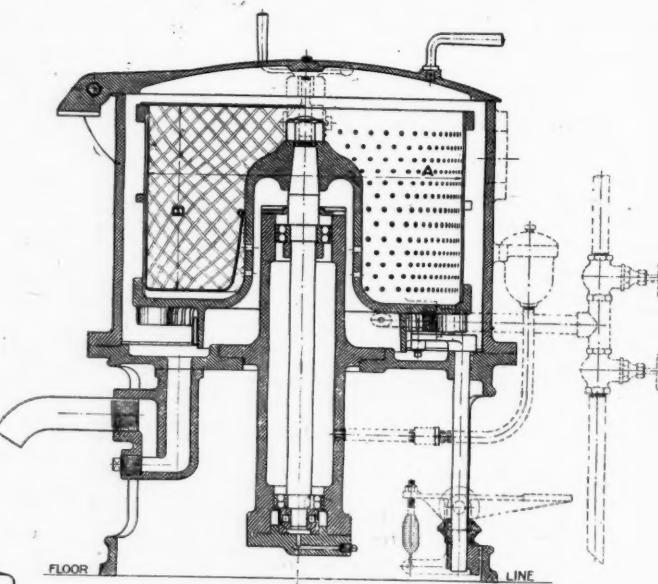
diameter of the lower portion of the bowl is greater than that above. In this recess solids heavier than water are deposited. It can be readily shown by theory that where two liquids are being separated as in the types of machine under consideration there is a perfectly definite cylinder of separation between them provided the discharge openings are free. From this it follows that no matter what the proportions of the two liquids, each will constantly discharge from its own opening if sufficient mixture was originally introduced to begin the process. Even if afterwards only one of the liquids is fed into the bowl it will be discharged from its proper opening and not from the other.

The De Laval Machine has proved this in actual practice.

In some installations of De Laval Machines where oil is recovered from swarf or from greasy waste, &c., the first step is a special hydro-extractor in which hot steam is admitted to the material to be cleaned and one of the best methods for doing this is by a steam turbine driven centrifuge, the exhaust steam of which passes through the material and the cage perforations. With a Sharples machine where a machine for fine work is used it is sometimes necessary to install a rough-machine.

For Research Work

For research work and preliminary investigations, two machines are worth mentioning. The first is a 9-inch machine,



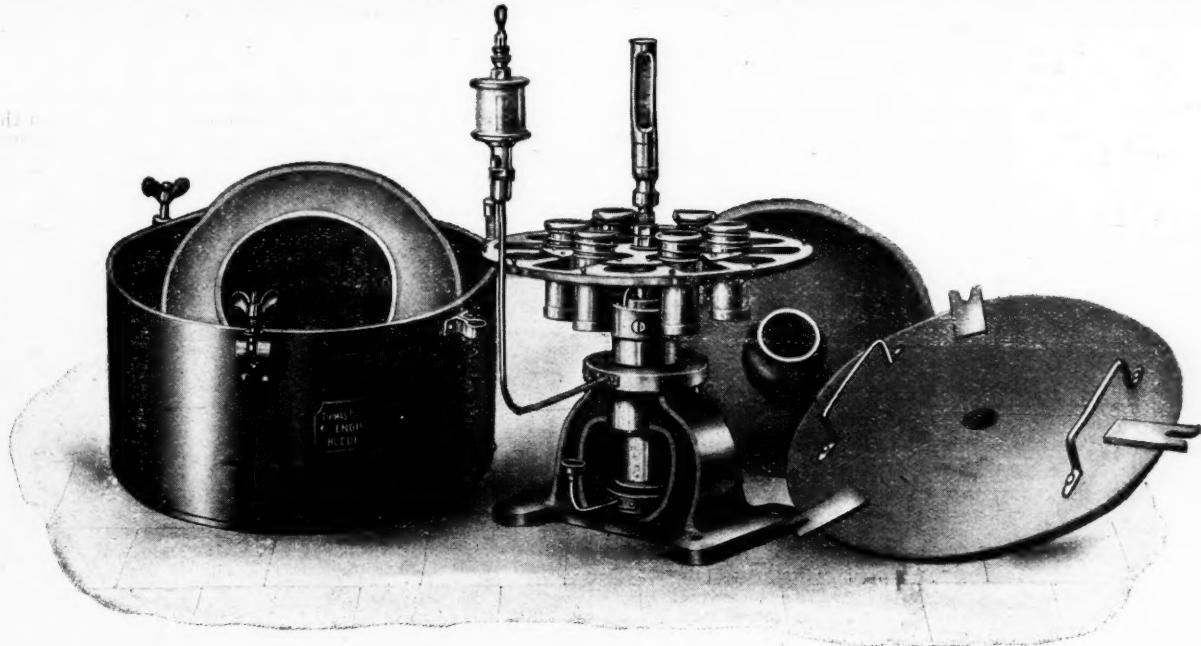
BROADBENT STEAM TURBINE DRIVEN CENTRIFUGAL GREASE EXTRACTOR.

and can be fitted with any type of cage. If a cage requires changing this can be done in a few minutes. Skimming apparatus, heating coils or other accessories can easily be fitted and it is certainly advisable for research work to have a machine with different fittings suitable for all kinds of substances. The speed should also be variable and care must be taken if a larger machines to be installed from the results of experiments with a laboratory machine to run this machine at a speed giving the same centrifugal effect as the larger one.

Another very important laboratory machine for analytical work consists of a number of steel swinging cups rotated on pivots on a steel disc. When the speed increases the axis

of the cups becomes horizontal and the forces on the pivots would soon be abnormally great. To overcome this difficulty

Small beakers can be placed in the cups and by the simple device of placing liquid of the same specific gravity as the liquid



BROADBENT ANALYTICAL CENTRIFUGE, SHOWING INTERIOR PARTS.

the support is through springs which become compressed and allow the cups to move bodily outwards so that finally the bottom of each cup rests on the periphery of the rotating disc.

under test outside the beaker to the same level as that inside there is no danger of them being broken by the stresses set up by centrifugal action.

Society of Public Analysts

At the ordinary meeting of the Society of Public Analysts held on Wednesday, December 1, at the Chemical Society's Rooms, Burlington House, Mr. Alfred Smetham, President, occupied the chair.

Certificates were read for the first time in favour of Mr. W. R. Schoeller, Ph.D., and for the second time in favour of: Messrs. Urban Aspey, Herbert Corner Reynard, B.Sc. (Lond.), A.I.C., Edwin Burnhope Hughes, B.Sc. (London.), A.I.C., Harry Jephcott, M.Sc. (Lond.), A.I.C., Arnold Lees, A.I.C.; Mr. T. K. Ghose, B.A., L.M.S. (Cal.) was elected a Member of the Society.

The President referred to the regret with which the Council had received the resignation of Mr. J. L. Baker from the Editorship of *The Analyst*, a position which he had so ably filled for the last 13 years, and congratulated him upon his appointment to the Editorship of the Journal of the Institute of Brewing.

The President announced that the Council had appointed Mr. C. A. Mitchell as his successor.

Papers Read

Mr. Raymond V. Wadsworth in a Paper on "Estimation of Theobromine," criticised the ordinary processes employed for the estimation of theobromine, and suggested a new method based on the employment of calcined magnesia and extraction with tetrachloroethane.

In a Paper on "A New Process for the Estimation of Small Quantities of Chromium in Steels," Mr. B. S. Evans said the process provided a means of estimating quantities of chromium of the order 0.01 per cent., which were outside the scope of the accepted methods. The steel was dissolved in sulphuric acid and oxidised with nitric acid, about 25 grams of ammonium phosphate added, and the whole boiled with excess of potassium permanganate to convert the chromium into chromate. The acid liquid was poured into excess of boiling caustic soda solution acidified with acetic acid, and made up to a known

volume; an aliquot part was filtered off, made strongly acid with sulphuric acid, and the chromium determined colorimetrically by matching with N/100 potassium dichromate. The process had been tested from 0.003 per cent. up to 15.0 per cent. of chromium, and gave good results over the whole range.

Some notes on the reactions between fulminate of mercury and sodium hyposulphite by P. V. Dupré and F. H. Dupré were read, and the authors described the titration of fulminate of mercury in sodium hyposulphite. The effect of boracic acid in retarding the secondary reaction, causing loss of alkalinity, and the evolution of heat caused by secondary reaction was then discussed, together with the bearing of this on the method of destruction of fulminate by hyposulphite. The effect of boracic acid on heat evolution was dealt with, and the final products in interaction between fulminate and sodium hyposulphite described.

Rubber Failure

CREDITORS and shareholders of British Rubber Manufacturers, Ltd., of Acton, met on Thursday, December 2, under a compulsory winding up order. Mr. E. T. A. Phillips, Assistant Official Receiver, presided. A statement of the company's affairs, he said, had been lodged showing in the case of creditors gross liabilities £110,149, of which £82,012 were unsecured, and assets valued at £45,160. The deficiency in the case of creditors and shareholders was stated at £69,508. The company was registered in October, 1914, to carry on the manufacture of india-rubber goods, and the trading, with the exception of the year 1916, when a profit of £8,486 was earned, had resulted in a loss. At the date of the winding-up order debentures for £24,000 were outstanding. The assets had been realized by a receiver for debenture-holders, who was appointed in May last, and he estimated that, after paying preferential claims and the debenture-holders, there would be a balance sufficient to pay a dividend of 2s. in the pound to the unsecured creditors. Mr. O. Sunderland was appointed liquidator.

Society of Chemical Industry London Section

A MEETING was held on Monday, December 6, in the rooms of the Chemical Society, Burlington House, Dr. Charles A. Keane presiding, in the absence of the chairman of the section, Mr. Julian L. Baker, through indisposition.

The CHAIRMAN said there was no need for him to introduce Dr. Levinstein to a London audience or, indeed, to any audience of the Society of Chemical Industry. They had all been familiar for many years with his work, and they felt it an exceptional advantage that the London Section had been able to secure his presence that evening to introduce a discussion on the dyestuffs industry, at such an exceptionally opportune moment.

Dye Industry and Protection

Dr. LEVINSTEIN said that the need for protecting the British dye industry had been acknowledged by both of Mr. Lloyd George's Governments, and, also by Mr. Asquith's Government, and the Government policy was announced in the House of Commons by Sir Albert Stanley, then President of the Board of Trade, as far back as May, 15th, 1918, when it was stated "that importation of all foreign dyestuffs shall be controlled by a system of licences for a period of not less than ten years after the war, in order to safeguard this industry against the great efforts which the great German firms are certain to make after the war to destroy all we have accomplished during the war, and to make this industry again subservient to Germany." That proposal was made on the advice of a Cabinet Committee of Mr. Asquith's Government, and since then the pledge had been renewed by Mr. Lloyd George and his two Governments. They might reasonably have hoped that a Bill would have been passed into law before now, in view of the pledges given. In that case they would have been spared the disorganisation of the aniline dye industry, which was caused by the large importation of German dyes during August, September and October of this year, and the necessity for throwing out of employment large numbers of workpeople engaged both in manufacturing and in new construction, and the feeling of uncertainty engendered in the minds of producers and consumers alike by the controversy which had recently arisen with regard to the Government's policy. If pledges such as those which had been solemnly given by Governments could not be relied upon nobody in the chemical industry could have the least confidence in any promise made in the House of Commons. He would not deal with the Bill, because he was indifferent as to the means adopted for building up the dye industry so long as they were adequate.

German Attitude

The German I.G. was now making desperate attempts to capture the key position in the world's industrial markets, and having re-established themselves they could refuse supplies altogether to our textile industry or use the advantage they held in the monopoly of the supply of dyestuffs for the purpose of political bargaining. That was no fanciful picture, because the Germans had actually attempted to do this in regard to Alsace in connection with the peace terms, because they knew that France had a difficulty in regard to the supply of dyes in Alsace. It was not possible to do the same with Great Britain at that time, because of the existence of large dye-making firms in this country.

If we were not in a position to produce toxic substances equally with the Germans the next war would certainly be a chemical war, and the results would be extraordinarily quick and decisive. The Germans selected gases because they were the only belligerent which had a large dyestuffs industry, which enabled them to manufacture poison gases.

Dr. Levinstein said that one of the functions of the society was to educate the public. It had been said that the only thing necessary to enable the British dyestuffs industry to compete against the I.G. was to give it sufficient money for research. He was as strong a protagonist of research as any man, but the mere endowment of laboratory research would not lead to any practical result, and he was afraid the people who saw a solution of all our difficulties in the subsidising of research had not taken the trouble to inquire into what was meant by industrial research. Organised industrial research could only be successfully carried out by great organisations willing to devote large sums of money not only to employing

adequate chemical staffs, but for experimental work on a very large scale, and who were prepared, as the result of these things, to erect large factories. If they had not a large organisation backed up by a large commercial organisation, all they could do as the result of laboratory work was to sell the inventions to somebody who had such organisations.

The commercial value of the Heber-Bosch process worked on a large scale was enormously enhanced after it had been worked out by the fact that it had behind it the commercial organisation of the Badische. That was a fairly good proof of the value of providing laboratory experiments without providing facilities for industrial and commercial exploitation. Another process belonging to the Badische was that for making synthetic indigo. That was due to Hoymann, and was not discovered at Friederichshaven, but the university laboratory of Zurich, but it required seven more years and a very large expense of money before it was developed commercially. Hoymann could not have developed his invention. The re-action was technically absolutely valueless, and only became commercial success after the practical technologists of the Badische had worked it out. These instances could be multiplied indefinitely. In the chemical industry there were magnificent research organisations directed by some of the most brilliant and original minds in the country, and staffed by the best young chemists obtainable. On them last year was spent, exclusive of capital, something over £100,000, and they employed about 100 trained research chemists.

Discussion

Sir WILLIAM PEARCE, M.P., said Dr. Levinstein had done a good deal to convince other people that the dye industry was a key industry. One of the difficulties of the present Bill was that before the war the textile industry in this country was treated by the Germans with the greatest consideration. The industry not only had the most favoured clause with regard to prices, but he believed dyes were sold in this country to the textile industry at prices lower than in Germany or any other country in the world. He was glad Dr. Levinstein had referred to the fixation of atmospheric nitrogen, because he had always felt that that was one of the reasons Germany went to war. In the first few weeks of the war Lord Kitchener had told a Committee of the War Office that oleum was the key of the position, and in consequence of the situation in which we found ourselves we came into the war with second rate mines and second rate torpedoes and insufficient chemicals to make the requisite amount of cordite for the purposes of the Army. He remembered the present Prime Minister saying from the Front Bench that, thanks to Lord Moulton, we were secured an ample supply of high explosives for ourselves and our allies.

Professor H. E. ARMSTRONG, F.R.S., referring to the remark made by Dr. Levinstein that it was necessary for the industry to educate the public, said he was afraid that they did not get at the public very easily, but he hoped that this address would be very carefully written out and probably amplified and a copy sent to every member of the House of Commons. He did not think Dr. Levinstein was quite correct in his argument with regard to indigo. The history of that was far more complex than had been stated in the lecture, and the real success of the industry had nothing to do with the academic worker or the colour works. There was no doubt that Dr. Levinstein's main argument was a sound one.

Mr. CARR agreed with Dr. Levinstein and previous speakers as to the vital importance of the organic chemical industry to this country. He was convinced that it was of vital importance that not only the dye industry but the whole of the organic chemical industry should be preserved in the interests of peace as well as of war.

Dr. M. O. FORSTER, F.R.S., said Professor Armstrong had referred to the question of commercial incentive to organic research. On that point he agreed with Mr. Carr in not agreeing with Professor Armstrong. He did not understand Dr. Levinstein to say anything diminishing in any sense whatever the importance of ideas. What Dr. Levinstein did was to emphasise the need of incentive to research. He regarded that as of tremendous importance.

Mr. W. J. U. WOOLCOCK, M.P., proposing a vote of thanks said it must not be imagined that the Bill was purely and simply one for the prohibition of the import of foreign dyes into this country. It was a Bill for the establishment of a dye industry in this country.

Micro-Organisms and Their Industrial Uses

Cantor Lecture by A. C. Chapman

WE give below an abstract of the first of a series of three Cantor lectures on this subject delivered at the Royal Society of Arts on Monday, by Mr. A. Chaston Chapman, F.R.S. The second lecture will be given on December 13, instead of December 6, as originally arranged, to avoid clashing with the December meeting of the London Section of the Society of Chemical Industry. Dr. M. O. Forster was in the chair.

Mr. CHAPMAN said that fermentation in its more modern and restricted sense—alcoholic fermentation—had already been somewhat fully discussed in its various aspects by previous Cantor lectures. Since 1878, when the earliest course of lectures on brewing was delivered by Charles Graham, the subject had been most ably expounded by such authorities as Hartley, Gordon Salamon, Percy Frankland, W. J. Pope and Adrian Brown. He himself proposed now to commence with the capital discovery by Buckner in 1897 that fermentation, like many other changes effected through the agency of the living cell, was due to an enzyme, to which he gave the name of Zymase. Lieby, however, towards the end of his life, in his memorable controversies with Pasteur, contended that the actual agent in the production of alcohol and carbon dioxide from sugar was not the living protoplasm of the yeast cell, regarded as a physiological entity, but some nitrogenous substance, produced by M. Buckner's discovery, while not facilitating the commercial production of alcohol had the great advantage of bringing one more process within the region of ascertained or ascertainable chemical laws, and of giving a very great stimulus to the further study of the mechanism of a process which had up to that time been regarded as a conspicuous example of the direct operation of some mysterious vital force.

Fermentation Process

The observation of Harden that the addition of sodium phosphate to sugar solutions which were undergoing fermentation was followed by a rapid increase in the evolution of carbon dioxide, was the starting point of an investigation which had thrown valuable light on the mechanism of the fermentation processes, and the following could be regarded as the general nature of the fermentation process.

The enzyme and zymase and its co-enzyme acted on the sugar (hexose) in the presence of the phosphate, in such a way that one-half of the sugar was decomposed into alcohol and carbon dioxide, whilst the other half united with the phosphate to form the hexose phosphate above referred to. The phosphate was thus rendered temporarily inoperative, but was liberated by the action of the enzyme "hexose-phosphatase," which reduced the sugar and phosphate, and so the circle of change was ready to be repeated.

This theory did not purport to tell us by what stages, if any, the dextrose molecule broke down, but merely dealt with the alcohol and carbon dioxide which were under ordinary circumstances the final products of its disruption. At one time it was widely held that lactic acid was formed as an intermediate substance, but that view had been abandoned. Some years ago it was suggested by Fernbach that pyruvic acid was an intermediate product in the breaking down of the sugar molecule, and a good deal of evidence in support of that theory was brought forward. There would appear to be very little reason to doubt that pyruvic acid and acetaldehyde were, in fact, intermediate compounds formed in the normal process of alcoholic fermentation.

More recently it had been shown by Newberg and Ehrlich that the commencement of fermentation was considerably accelerated by aldehydes generally, the acceleration at constant temperature being in some cases more than one hundred-fold. The interesting observation had also been made that fermentation by yeast power was accelerated to a greater extent than fermentation brought about by the living cell, the explanation being apparently that, in the latter case, aldehydes were probably produced by intra-cellular decomposition of the amino-acids. It was remarkable that the aldehydes which had always been regarded as toxic to living cells and inhibitory of enzymic activity, should prove to be such powerful stimulants of alcoholic fermentation. There was

also the further fact that the behaviour of the enzymes within the cell differs materially from that of the same enzymes in the expressed force.

The keynote of these lectures was, he firmly believed, that as chemists they would—for a long time at least—become more and not less dependent on the powers (both synthetical and analytical) of living cells, and it therefore behoved them to study carefully the conditions which affect the activities of those cells, and which might even induce them to function in one direction or another at will.

Glycerine Production

From time to time numerous experiments had been made with the object of ascertaining whether the proportion of glycerine could be increased by varying the fermentation conditions, and by working with yeasts of different species, and results in the neighbourhood of 7 and 8 per cent. were occasionally recorded. The subject, however, remained one of academic interest until the War, when the production of glycerine in large quantities became a matter of vital importance to all the belligerent countries. Early in 1917 the Germans were producing large quantities of glycerine in this manner, and probably the actual experiments were made very shortly after, if not before, the outbreak of war. In a paper recently published Connstein and Ludecke gave some account of their experiments. They tried the effect of adding to the sugar solutions various alkaline salts, such as disodium, hydrogen, phosphate, ammonium carbonate, sodium acetate and sodium bicarbonate, and found that the yield of glycerine could be increased in this way to about 10 per cent. Great difficulties were at first encountered owing to the rapid development of bacteria (especially those producing lactic acid) in the alkaline medium, and this was eventually overcome by the employment of sodium sulphate as the alkalisising agent. Working in this way they found that with 40 per cent. of sodium sulphate the yield of glycerine reached 23 per cent., and that when the weight of the sulphite used was twice that of the sugar as much as 36 per cent. of glycerine could be obtained. All fermentable sugars and crude materials like molasses could be utilised. The process was ultimately handed over to the army authorities, who organised a company which is said to have made 1,000,000 kilogrammes of glycerine a month, the yield being from 20 to 25 per cent. of the sugar used.

As showing the progress made by this so-called amylo-process since its introduction some 20 years ago, it was mentioned that a quantity of absolute alcohol approximating to 6 million hectolitres had been prepared. Of this France had prepared about 2½ millions, Spain about 1 million, Italy about ¾ million, America about ½ million, and other countries the remainder. In 1916, according to M. Paul Bond, the output in France alone amounted to 665,232 hectolitres, as against 880,821 litres in 1912.

Industrial Alcohol

Whatever views we might hold about alcohol as a beverage, it was abundantly clear that for industrial and power purposes it was becoming a commodity of the highest national importance. Before long indeed, its consumption for industrial purposes might come to be regarded like that of sulphuric acid and soap, as an indication of the degree of civilisation to which a country has attained. It might perhaps be added that in this country the Amylo-process was not available owing to certain excise restrictions. It was to be hoped, however, that the excise authorities would do everything possible to remove this reproach, and that they and other Government Departments would do all in their power to encourage the application in this country of the latest teachings of science to industrial practice. If they did not, the handicap would be too great and we should have to be content to take a second place and to see other countries out-distancing us in the race. No Government could afford to ignore scientific discoveries, and industrial developments which were taking place under their very eyes, and if there was one thing which, during recent years, had been made more apparent than another it was that the country which was foremost in the encouragement of its scientific men and in the utilisation of their discoveries would ultimately win the race at the expense of those which had been more neglectful in that respect. The possession by the latter of greater natural resources would only serve to stave off defeat for a time.

Institute of Chemistry

Some Scientific Aspects of Tanning

BEFORE the war it used to be the practice of the Institute of Chemistry to have during the session lectures on various chemical and allied subjects by acknowledged experts in particular branches. This practice was resumed on Wednesday, November 24, when Mr. Joseph T. Wood, F.I.C., of Turney Bros., Ltd., of Nottingham, gave a lecture at University College, Gower-street, London, on "Some Scientific Aspects of Tanning," of which we are able to give an outline. In the absence of Sir Herbert Jackson, K.B.E., F.R.S., who is just recovering from indisposition, and originally intended to preside, Professor F. G. Donnan, F.R.S., took the Chair. In introducing the lecturer, Professor Donnan commented upon the fact that although artificial leathers have been made, they are not up to much, and the manufacture of leather artificially is one of the few things which the chemist has not yet been able satisfactorily to undertake. He also drew attention to the fact that leather is one branch of chemistry which has not been studied to the extent it should have been in this country hitherto.

Leather Chemistry

In the course of his lecture, Mr. Wood necessarily covered a good deal of ground well known, at any rate, to those engaged in the industry, and touched briefly upon the history of the whole subject, which he said dated back several thousand years, evidence of which was given in the lantern slides which were shown. As to the importance of the industry, he mentioned that in 1918 8,000,000 hides of calf skins were tanned in the United Kingdom, having a value of £30,000,000, and 181,000,000 sq. ft. of upper leather, of similar value, whilst quantities of other forms of leather were manufactured, during the year amounting in value to over £5,000,000. Discussing the technical aspects of the various processes of manufacture, which were divided into preparatory processes, tanning and finishing processes, the lecturer emphasised the point that the work is of such a complex nature that the industry has developed in the course of ages almost on a basis of trial and error, the practical man learning by failures, but not troubling himself about the why and the wherefore. Of later years the application of scientific principles to the processes involved in leather making had been carried considerably further, but notwithstanding the large amount of work done by Bayliss in England, Brailsford Robertson in America, Emil Fischer in Germany, and Abderhalden in Austria, we were still far from having a clear understanding of all the problems involved. A more or less detailed discussion was entered into concerning the collagen molecule of skin, collagen being the name given to the dry skin free from all adhering matter and consisting almost entirely of fibrous tissues. The long controversies as to whether tanning was a chemical process or an adsorption phenomenon were recalled, but Mr. Wood held the opinion that the work of Professor Proctor and his pupils had shown that much that had been attributed to surface action was really subject to very general laws, and could be fully explained by mass action, electro-chemical attraction and osmotic pressure. Again, as instancing the complex character of leather manufacture, it was pointed out that, although tanning is a chemical industry, it is also a biological industry, and consequently it was essential to regard tanning as a biochemical industry. The chemistry of skins was one of the most complex subjects in the whole domain of chemistry, inasmuch as it involved the chemistry of living matter. It was having regard to the extreme difficulties of the whole subject that Mr. Wood confined himself, in dealing with tanning, to explaining the comparatively simple re-actions which take place in chrome tanning, although he admitted that even here there is room for differences of opinion as to the interpretation of facts.

Dyeing of Leather

In the latter part of the lecture the dyeing of leather and the importance of the functions of the tannery chemist were dealt with. Mr. Wood strongly urged that the chief chemist should be brought into contact with the commercial side of the business in order that he might be fully acquainted with the results being obtained, and the manner in which they might be influenced for good by modifications and improvements in the work in the laboratory. Bearing upon this and research work generally, he congratulated the trade upon having formed a research association.

Chemical Matters in Parliament

Benzol

SIR ROBERT HORNE, replying to Sir H. Brittain (House of Commons, November 29), said that the average monthly production of refined benzol in the United Kingdom during the first nine months of the current year was understood to have been approximately 1,650,000 gallons, compared with an average monthly production during the year 1918 of 2,200,000 gallons.

Sir H. Brittain: Has anything been done to remedy this state of affairs?

Sir R. Horne: I am not perfectly certain what the causes are for the reduction in the production of benzol. My own impression, for what it is worth, is that the reduced output of coal has had the effect of reducing the output of by-products.

Imports and Exports of Dyes

Mr. Allen Parkinson asked the President of the Board of Trade: (1) what was the quantity of dyes imported from Germany to Switzerland during each month of this year; (2) what was the quantity of tar and other by-products of coal exported to Germany and Switzerland, respectively, during each month of this year; and what was the quantity of dyes imported from these countries during the same period?

Sir R. Horne: These questions involve the preparation of statistical tables. I will have them circulated in the *Official Report* when they are ready.

Power Methylated Spirits

Mr. Chamberlain, replying to Lieut.-Colonel Bell (House of Commons, November 29), said that the question of a suitable denaturant to be used in this country for power methylated spirits was under consideration. In coming to a decision regard would be paid to the desirability of not adding materially to the cost as well as the necessity of providing adequate revenue safeguards. He was not yet in a position to say when an announcement on the subject could be made.

Tungsten Ores

Mr. James Hope, Parliamentary Secretary to the Ministry of Munitions, replying to Mr. Wignall (House of Commons, December 6), said that the Government had made extensive purchases of tungsten ore during the war, but was no longer under any obligation to purchase such ore either from Empire or Foreign sources. As a result of contracts entered into during the War, approximately 1,271 tons of tungsten ores had been received from Australia during the present year, but it was not desirable to give the prices. The unsold stocks held by the Government at present of wolfram and molybdenite did not exceed 200 tons.

Zinc Concentrates

Sir P. Lloyd-Greame, replying to Mr. Wignall (House of Commons, December 6), said that the Government were under agreement to purchase Australian zinc concentrates for a period of ten years next following the declaration of peace, but production had been suspended at Broken Hill during the past twelve months owing to a strike, and no concentrates had been received since January 1, 1920. Stocks of concentrates were held in Australia by His Majesty's Government amounting to 503,000 tons. As regards the last part of the question, he was not prepared to recommend any extension of the buying operations of the Government.

Oil Borings in Derbyshire

Mr. Hope, replying to Mr. Holmes (House of Commons, December 6), said that of the seven Derbyshire wells one had been completed, two had been temporarily shut down to await the results obtained from others now drilling, and four were still in operation; the latter had all reached a depth of over 3,000 feet. The well at Hardstoft still continued to produce steadily at 50 barrels per week, the total production to November 27 being 4,318 barrels or 557 tons. 500 tons of crude oil at present in storage had recently been sold by public tender and realised £22 10s. per ton; this oil was now in course of removal for refining.

Employment in Lead Processes

In the House of Lords on Monday, the Women and Young Persons (employed in lead processes) Bill was read a third time and passed.

From Week to Week

Yale University has completed plans for a new building for its department of chemistry.

Thirty-six-million marks represents the capital involved in the combine of two of the largest German breweries.

For unlawfully importing 40 oz. of opium Lam Ham, a Chinese seaman, was fined £20 at East Ham last week.

Auriferous clay has been discovered in France. While digging a well at Gif, Seine-et-Oise, a 23-in. vein was revealed.

Edinburgh University is to extend its medical chemical departments, and for the purpose £500,000 is being asked for.

The King, writing to the Court of the University of Wales, says: "I recognise how greatly the future prosperity of every country will depend upon the development of its higher education and scientific research."

The Board of Trade (Licensing Section) have announced that, as from December 2, 1920, an Open General Licence has been issued for the export of photographic chemicals containing not more than 20 per cent. coal-tar derivatives.

Dr. Charles Carpenter, chairman of the South Metropolitan Gas Co., announced the decision of the board of the company to subscribe £1,000 to the Livesey endowment at Leeds University for encouraging research in gas and fuel problems.

M. Laurent Fynoc, Commissioner for Liquid Fuel, has completed his Bill, which will shortly be submitted to the French Cabinet. The Bill, which establishes a petroleum monopoly, affects the importation of refined oil and petroleum spirits.

As from December 6 all communications relating to mines and quarries must be addressed to the Secretary, Mines Department, Hotel Windsor, Victoria-street, S.W.1., all powers and duties with regard to mines and quarries having been transferred from the Home Office.

A gift has been received by the University of Belfast from W. H. Dorman & Co., Ltd., Stafford, of a four-cylinder, 12 H.P. engine, which will be of great value as an example of modern engine design and manufacture, and also for purposes of instruction, and as a reserve source of power in the laboratories.

All goods, except those specified as "luxury" articles, are allowed to enter Bulgaria now without a licence or permit. Among the "luxury" articles are volatile oils, and artificial aromatic preparations; perfumes and all toilet articles, except tooth pastes and washes for the head; steriopin.

Sir William Alexander has been appointed a director of the British Dyestuffs Corporation, Ltd. Sir William is the Government representative on the Board of the British Cellulose and Chemical Manufacturing Co., Ltd. He is also the Managing Director of Charles Tennant, Sons & Co., Ltd.

It is anticipated, says the *Berliner Tageblatt*, Berlin, that the sum of two milliard marks will be required by the German Anilin group before the close of 1921 for the purpose of extending the nitrogen works. There is, therefore, every prospect that the group in question will shortly be obliged to draw upon the German money market.

Dr. H. N. Morse, professor of Chemistry and Director of the Chemical Laboratory at the Johns Hopkins University, has died. Dr. Morse wrote a number of scientific papers on atomic weights of Cadmium and Zinc, the preparation of Osmotic Membranes by electrolysis, and cells for the measurement of high Osmotic pressures. He was born in 1848.

Lord Pirrie, of Harland & Wolffs, who has been abroad studying oil supplies, advises shipowners and shipbuilders to go slow in converting vessels to the oil-burning type. He considers that until Mexico gets into a more settled state, and its Government decides to protect foreign capital, there is a risk in going in for too large a programme of vessels built for oil fuel consumption.

The hearing was begun in the King's Bench Division on Thursday, December 2, of an action by Manchester Ship Canal Company against Brunner, Mond & Co. A claim was made in regard to canal tolls and ship dues between the junction of the River Weaver and Eastham on the canal, in the salt district. It was also alleged that breaches of statutory obligations had occurred.

Birmingham and Midland Institute Scientific Society's Annual Soiree will be held at the Institute on January 5, at 7.15 p.m. A lecture will be given by Mr. J. R. Ratcliffe in Room 15. There will be a concert and an exhibition of microscopes, scientific objects and experiments. Dancing will take place in Room 5. The number of tickets is limited, and the price will be 4s. after January 1st, or 3s. before that date.

At the Leeds Assizes on Friday, December 3, Mr. Joseph Edgar Abson, farmer, of Wellgate Farm, Glasshoughton, Castleford, was awarded £130 damages against the Yorkshire Coking and Chemical Co., Ltd., for damage done by defendants' coking ovens to his crops. The evidence showed that fumes from the works caused the damage by bringing the crops to maturity too quickly, with the result that they did not yield so well. The award was for damage done in four years.

The National Aniline & Chemical Co., Inc., of America, has announced the production of two new dyes, National Erie Violet 2B and National Erie Fast Gray M, both important additions to its series of direct dyeing colours. National Erie Violet 2B produces violet shades possessing a very fine bluish tone of good fastness to light. National Erie Fast Gray M yields good grays on cotton, as well as cotton and wool, and cotton and silk unions.

Recently the staff and employees of H. C. Fairlie & Company, Ltd., Camelon Chemical Works, honoured Mr. Frank Fairlie (one of the principals) on the occasion of his marriage. Mr. John Callander (works foreman) presented Mr. Fairlie with a handsome silver tea set and the recipient suitably replied. Mr. James Fairlie (the chairman of the firm) thanked the staff and employees on behalf of the directors for their generous gift, which, he said, showed the good feeling existing between employee and employer.

German nitrate producers who are outside the Chile Producers' Association, who have two million quintals for sale up to June 1921, are to be allowed to join the Association, immediately, providing they withdraw from the market entirely. The Association is to pay 3s. 6d. per quintal on the quantity. This will presumably be paid for by the production from the associated producers' sales of probably 2d. per quintal on their total sales for the year ended June next. The average selling price up to June 30th next is about 16s. 5d. per quintal. Folsh & Co. have declined to join the Association.

The Secretary of the Joint Committee of the National Union of Scientific Workers, the Institute of Chemistry, and the British Association of Chemists has been informed that arrangements have been made for the Commissioners of Inland Revenue to meet a deputation of scientific workers on Friday, Dec. 10, to afford them the opportunity of supporting their claims in the matter of income-tax abatement which they have set out under six distinct heads in a memorial which was sent to the Lords of the Treasury.

A jury at the Leeds Assizes last week awarded Mr. James Thomas Bamforth, of St. Helen's-road, Dringhouse, near York, £500, inclusive damages against Mr. Reginald Grantham, chemist and druggist, of 66, Blossom-street, York, on the ground that he had suffered personal injuries through the negligent making-up of a prescription. The plaintiff had a prescription for ear drops made up for him by the defendant which when used caused intense pain and irritation, and eventually resulted in the permanent loss of the sense of hearing in his right ear. When the bottle of lotion was subsequently analysed it was found to contain 10.3 per cent. of phenol, a form of carbolic acid, instead of 6.2 per cent.

A general meeting of the Royal Institution was held on Monday, Sir James Crichton-Browne, treasurer and vice-president, in the chair. Professor J. Perrin (Paris) and Professor C. Fabry (Marseilles) were elected honorary members; and Mr. A. C. Chapman, Mr. N. D. Grinké-Drayton, Mr. W. J. Hemp, Mr. G. H. Nash, Mrs. L. Pennington, Dr. J. Taylor, Mr. J. S. Weir, and Mr. R. E. Winkfield were elected members. Dr. Arthur Keith was re-elected Fullerton Professor of Physiology for a further term of three years. The lecture arrangements for the coming session were announced. The Christmas Course of Juvenile lectures this year will be delivered by Professor J. Arthur Thomson on the "Haunts of Life," commencing on Tuesday, December 30, with the "School of the Open Shore," followed by the "Open Sea," the "Great Deeps," the "Freshwaters," the "Conquest of the Land," and the "Mastery of the Air."

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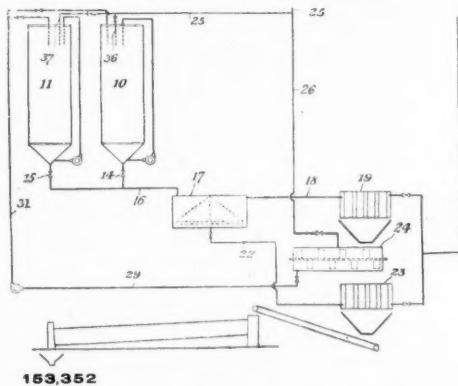
153,343. RUBBER, MANUFACTURE OF. P. Schidrowitz, 57, Chancery Lane, London, W.C. 2, W. Feldenheimer, and W. W. Plowman, 20, Holborn Viaduct, London, E.C. 1. Application date, June 2, 1919.

Apparatus used, June 2, 1929.

A composition of india-rubber which cures rapidly and has an increased breaking strain, toughness, and distensibility is made from a mixture of india-rubber 228 parts, sulphur 12 parts, and specially prepared clay 160 parts. The clay is mixed with an equal weight of water and a deflocculator is then added in sufficient quantity to produce fluidity. The clay is then dried, while in this state and mixed with the other ingredients. If about 0.25 per cent. to 1 per cent. of sodium carbonate is used as a deflocculator, a clay is produced which accelerates the cure of the rubber and slightly increases its distensibility. If a further addition of the deflocculator is made until the fluidity at first produced, decreases, or if this condition is reached in one operation by using 3 to 5 per cent. of sodium carbonate, it is found that the rate of cure is still further increased and the distensibility is greatly increased. Alternatively the clay may first be cleaned and dried and then deflocculated afresh, and dried in this state.

153,352. ALUMINIUM HYDRATE, PROCESS OF AND APPARATUS FOR PRECIPITATING. R. S. Sherwin, 3125, Bond Avenue, East St. Louis, Mo., U.S.A. Application date, July 8, 1919.

1919. Aluminium hydrate is precipitated from alkali metal aluminate solution by the presence of hydrate particles in suspension in the aluminate liquor. The solution is supplied to the precipitating tanks 10, 11 by the pipes 25, 36, 37, and circulated carrying aluminium hydrate in suspension until precipitation is nearly complete. The solution is then drawn off through the valves 14, 15 and pipe 16 to a continuous settling tank 17. This tank may be a Dorr thickener, having slow rotating radial arms carrying blades which move the thickened material to a central discharge opening. The over-

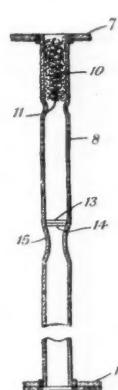
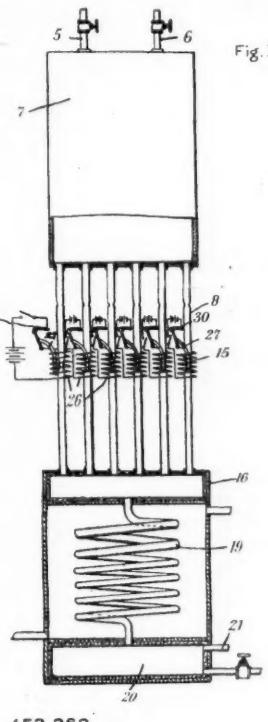


flow into the pipe 18 contains the finer portion of the precipitate (about 10-20 per cent.) and passes to a filter 19, which retains the hydrate. The main portion of the hydrate passes through the pipe 22 to the filter 23, where it is filtered and washed. When sufficient of the fine precipitate is collected in the filter 19, it is transferred to the tank 24 and agitated with fresh sodium aluminate solution supplied through the pipe 26. This mixture is then supplied to the precipitating tanks through the pipes 29, 31. The use of the fine material as the precipitating agent causes the more rapid precipitation of the hydrate. The solutions from the two filters are mixed and returned to the digesters to be saturated with aluminum hydrate in solution. Modifications of the apparatus are also described.

153,362. NITRIC ACID, MANUFACTURE OF. A Henwood, 306, Kent Road, Cynwyd, Pa., U.S.A. Application date, July 29, 1919.

The object is to obtain nitric acid of high concentration by

the oxidation of ammonia with a comparatively low catalyst temperature. Dry ammonia gas mixed with oxygen is supplied through inlets 5, 6 to a mixing tank 7, and the mixture passes to the reaction tubes 8 which may be of quartz, glass or duriron. The upper part of each tube contains asbestos fibre 10 supported by nichrome wire 11 to prevent back firing, and the catalyst 13 consists of a small mass of platinum sponge resting on a support 14 of alundum, which rests on a constriction 15 in the tube. The acid produced passes into the header 16, and thence to the condenser 19. The acid is collected in the chamber 20 and gas passes off



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by the outlet 21. The catalysts may be heated initially and the desired temperature maintained, by resistance coils 26 which are controlled by a thermostatic element 27 operating a rheostat 30. The temperature is regulated mainly by the use of an excess of oxygen in such quantity and pressure as to operate as a cooling medium and maintain the catalyst at the lower limit of permissible temperatures compatible with optimum yield and desired concentration. Nitric acid having a strength of 84 per cent. of commercial acid can be obtained, or by increasing the pressure of oxygen a fuming acid containing 78 per cent. of nitric acid can be obtained.

153,434. FERTILIZERS AND THEIR METHOD OF MANUFACTURE. W. H. Hyatt, 2, Springfield Road, Kingston-on-Thames, Surrey, and E. N. Fellowes, 1, Great Winchester Street, London. Application date, September 26, 1919.

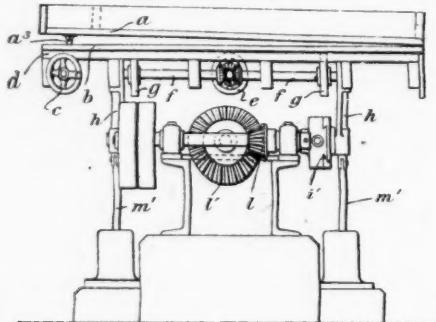
Street, London. Application date, September 26, 1919.
The object is to obtain a solid fertilizer containing calcium carbonate, calcium sulphate, and sodium sulphate. Dry nitre cake is mixed with sufficient chalk to neutralize the free sulphuric acid and leave about 13 per cent. of calcium carbonate in the fertilizer.

153,481. WATER CONCENTRATION OF ORES OR THE LIKE, APPARATUS FOR. W. M. Martin, Meadowcroft, West Trewoigie, Redruth, Cornwall. Application date, December 16, 1919.

Serial 16, 1919.

A separating table *a* is supported on a base *b* and given any desired inclination by means of a hand-wheel *c* actuating worm gears which operate threaded bolts *a*³. The base *b*

is supported on another base *d* and may be inclined by means of a hand-wheel *e* operating a pair of mitre wheels which rotate a spindle *f* carrying a pair of cams *g*. The base *d* is carried by brackets *h* mounted on pins carried by blocks *i*¹, which can be fixed in different positions relatively to the



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horizontal shaft shown by a transverse screw attached to the blocks and indicated in end elevation. The shafts *j* are all rotated in the same direction by bevel gearings, such as *l*, *l'*. The weight of the table is taken by dashpots having piston rods *m* pivoted to the rods *h*. The mineral is delivered to the lower end of the table, and the water to the upper end, while the table is given a uniform circular movement whose amplitude can be varied according to the eccentricity of the blocks *i*¹. The values tend to travel up the incline while the gangue travels downwards. A further separation of metalliferous particles is effected by providing the table with parallel grooves *n*, *o*, separated by a ridge *p*. The groove *n* retains the finer particles while the coarser particles pass over the ridge *p* to the groove *o*.



153,481

153,494. PHENOLIC ALDEHYDE CONDENSATION PRODUCTS, PROCESS FOR THE PREPARATION OF. A. T. Birkby and F. E. Birkby, Woodfield Mills, Liversedge, Yorkshire. Application date, January 13, 1920.

A phenol aldehyde condensation product is produced by the reaction of phenol or its homologues 500 parts by volume, 40 per cent. formaldehyde solution 450 to 550 parts by volume, and sulphuric acid in the proportion of 2 to 6 per cent. of the phenol. The acid is made by mixing 20 parts by volume of 1.84 sulphuric acid with 80 parts of water. The mixture is heated for 1 to 2 hours to 60°C. to 80°C. in a digester with agitation. The liquid is then run off and the mixture neutralized with excess of milk of lime. The excess of water is then removed by distillation under reduced pressure.

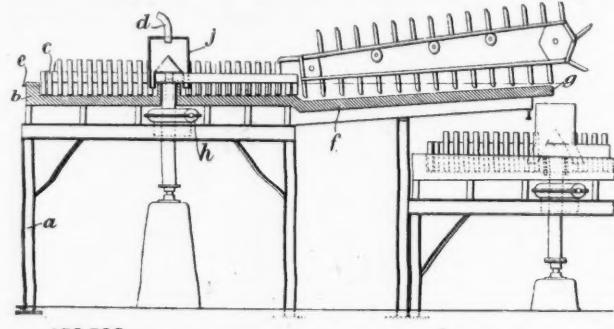
153,500. OXIDE OF ALUMINIUM FROM CHLORIDE OF ALUMINUM, PROCESS OF PRODUCING. S. E. Sieurin, Höganäs, Sweden. Application date, January 19, 1920.

Raw materials containing aluminium are dissolved in hydrochloric acid, and the solution saturated with hydrochloric acid gas to precipitate crystals of aluminium chloride, which are then calcined to obtain aluminium oxide and hydrochloric acid. The gas usually given off during calcination contains a large quantity of steam, so that the acid obtained is not sufficiently concentrated, but it has been found that the main part of the water is driven off at the commencement of the calcination. A continuously working furnace of several stories is used with separate outlets from the different stories, so that only the gases rich in hydrochloric acid are used. Alternatively, the mixture from a common calcination furnace is condensed so that water is first eliminated, and the strong gas is then led into the aluminium chloride solution.

153,503. ORES AND THE LIKE, PROCESS AND APPARATUS FOR WASHING. C. A. Edgley, 9, Urlay Nook, Yarm-on-Tees, Yorks. Application date, February 3, 1920.

The ore to be washed is admitted through a shoot *d* to a box *j*, and thence to a circular basin *b*, which is provided with a

rotating stirrer *c*. A trough *f* extends from one side of the basin in a direction inclined slightly upwards, and contains a travelling conveyor which discharges the washed material over the edge *g* to a second apparatus for further treatment. Water is sprayed or allowed to flow on the ore at or about the



153,503

middle of the trough *f*, and flows downwards over the ore against the movement of the latter. The liquor is drawn off by the pipe *e*. The apparatus is suitable for treating chloridised roasted ore.

153,520. SACCHARIN, MANUFACTURE OF. Société Chimique des Usines du Rhône (Anciennement Gilliard, P. Monnet et Cartier), 89, Rue de Miromesnil, Paris. International Convention date, (France), January 24, 1920.

The object is to manufacture saccharin by oxidation of orthotoluene-sulphamide with chromic acid or a mixture of sulphuric acid and alkali bichromate. In one example, a mixture of 10 parts of chromic acid and 50 parts of 50 per cent. sulphuric acid is heated to 35°C. and agitated, and 8 parts of ortho-toluene-sulphamide and 20 parts of 98 per cent. sulphuric acid are then added. The temperature is maintained between 35°C.-40°C. until the colour of the mixture has changed from red to green, and the mixture is then poured on to broken ice and filtered. A mixture of saccharin and ortho-toluene-sulphamide is obtained, and these are separated by any known method. It is essential that the sulphuric acid with which the chromic acid is mixed should be at least 35 per cent. strength. The acid solution of chromic sulphate obtained may be used for preparing chromic salts or for the electrolytic recovery of chromic acid. Other examples are also given.

NOTE.—The following specifications which are now accepted were abstracted in THE CHEMICAL AGE when they became open to inspection under the International Convention; 126,646 (C. Catlett), relating to processes for making oxysalt compositions, see Vol. I, p. 176; 137,300 (Rosenoff Process Co.), relating to fractionating apparatus, see Vol. II, p. 287; 138,362 (L. Avellana), relating to a wood gas producer, see Vol. II, p. 413; 138,594 (G. H. Hultman), relating to chrome alum, see Vol. II, p. 414; 143,885 (Kinzlberger & Co.), relating to purifying anthraquinone, see Vol. III, p. 163; 146,869 (Farbwerke vorm Meister, Lucius & Bruning), relating to pyridine bases, see Vol. III, p. 381; 147,908 (T. Goldschmidt Akt.-Ges. and O. Matter), relating to ethylene chloride, see Vol. III, p. 455.

International Specifications Not Yet Accepted

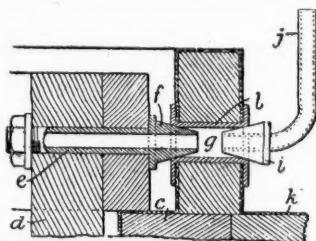
151,259. ALUMINA AND NITRIC ACID Norske Aktieselskab, for Elektrokemisk Industri Norsk Industri-Hypotekbank, 24, Toldbodgaten, Christiana. International Convention date, September 19, 1919.

Aluminium nitrate solution preferably containing also calcium or sodium nitrate, is kept at a constant temperature of about 140°C. to distil off dilute nitric acid. The temperature is maintained by the addition of water, steam or fresh solution. A crystalline precipitate of basic aluminium nitrate free from iron is obtained and this may be heated to obtain alumina and oxides of nitrogen, which are converted into nitric acid. The aluminium remaining in the mother liquor is converted again into normal nitrate by adding nitric acid, and the nitrate is crystallised by evaporation and re-

turned to the original solution. The presence of calcium or sodium nitrate in the solution may be secured by adding a base such as limestone to the solution before heating. The basic nitrate may alternatively be precipitated by heating the mixed solution in an autoclave.

151,260. ELECTROLYSIS; NICKEL. G. Haglund, 24, Toldbodgaten, Christiania. International Convention date, September 17, 1919.

Liquid is withdrawn from a diaphragm cell by means of a tube *e*, passing through the cell wall *d*, and terminating in a conical plug *f*, which fits in a liquid-tight manner into a sleeve *l*. The latter is placed in an opening *g* in the wall of the vat, and the pressure between the cone *f* and the sleeve *l* is main-



151,260

tained by a removable wedge between the vat wall and the other side of the cell. A similar conical plug *i* fits into the other side of the sleeve *l*, and conducts the liquid to a bent tube *j*, discharging into a tank *k*. The level of the liquid in the cell is adjusted by rotating the plug *i* and tube *j*, and the tube is turned into the position shown when the cell is to be removed. When obtaining nickel, the cell contains acid nickel sulphate solution with lead anodes, and the vat contains neutral nickel sulphate solution. The parts *e*, *l*, *j* are of lead-antimony alloy.

LATEST NOTIFICATIONS.

154,558. Economic method of distilling crude mineral oils, volatile hydro-carbons, or any other volatile products. Granger, L., Mariller, C., and Soc. Anon. D'Exploitation De Procedes Evaporatoires (Système Prache et Buillon). Nov. 26, 1919.

154,562. Process for the manufacture of a mixed manure containing a variable amount of nitrogen and fertilising-salts. Soc. D'Etudes Chimiques Pour L'Industrie. Nov. 25, 1919.

154,574. Process for producing from organic raw materials a mass useful for manufacture. Schonbeck, M. Nov. 21, 1919.

154,579. Production of aldehyde and acetic acid. Wohl, A. Nov. 24, 1919.

154,599. Elastic-fluid turbines. Aktieselskabet Atlas. May 27, 1918.

152,563. Process for the manufacture of a mixed manure containing a variable amount of nitrogen and phosphates. Soc. D'Etudes Chimiques Pour L'Industrie. Nov. 25, 1919.

Specifications Accepted, with Date of Application

138,328. Glycerol from sugar. Manufacture of. Vereinigte Chemische Werk Akt.-Ges. April 22, 1916. Addition to 138,099.

140,372. Fish oils. Deodorisation and other purification of. Nordiske Fabriker De-no-Fa Aktieselskab. March 18, 1919.

144,712. Coal shale or other bituminous substances. Apparatus for the low temperature distillations of. Karl, Prince of Lowenstein, A. Irinyi and T. Kayser. October 28, 1918.

150,991. Hydrogenation apparatus. Dayton Metal Products Co. October 5, 1918.

153,926. Vanadium from certain iron ores. Process for recovering. W. M. Goodwin and A. F. G. Cadenehead. May 16, 1919.

153,942. Oleaginous substances. Process of producing solidification of. B. Scobel. August 5, 1919.

154,029. Bi-polar electrode electrolyzers. G. G. Hepburn and Mather & Platt. September 26, 1919.

154,048. Crucible furnaces and the like. Economiser for coke-fired. G. Batty. October 22, 1919.

154,057. Fertiliser and insecticide. W. B. Baker and M. C. Shepherd. October 31, 1919.

154,089. Electrolytic cells. Indicators for. I. H. Levin. December 31, 1919.

154,108. Copper and zinc. Process for the electro-deposition of alloys of. S. O. Cowper-Coles. February 24, 1920.

154,111. Potassium sulphate and hydrochloric acid. Manufacture of. Fabriques de Produits Chimiques de Thann et de Mulhouse. December 4, 1919. Addition to 137,296.

154,112. Colloidally-soluble metal pyrophosphate casein compounds. Process for the manufacture of. H. R. Napp. (Hoffmann-La Roche & Co.) February 28, 1920.

154,147. Crucible hole. Holder for the cover brick of. W. H. Silvester. July 13, 1920.

Applications for Patents

Attack, F. W. Oxidation of hydrocarbons. 34274. December 4. Baker, Sons, & Perkins, J. Apparatus for cooling liquids, &c. 33987. December 1.

Boving, J. O. Turbines and centrifugal pumps. 34098. December 2.

British Dyestuffs Corporation. Clemo, R. G., and Perkin, W. H. Manufacture of basic blue colouring-matters and sulphur-containing intermediate compounds for use therein. 33837. November 30.

British Thomson-Houston Co. (General Electric Co.). Manufacture of carbon. 34126.

Clavey, G. A. Appliances for burning liquid fuel alone or in conjunction with solid fuel and colloidal mixtures. 33932. December 1.

Dreyfus, H. Manufacture of solutions, compositions, &c., having a basis of cellulose acetate, &c. 33948. December 1.

Dunningham, A. C., and Hargreaves, L. Manufacture of sodium thiosulphate. 33958. December 1.

Farbwerke vorm. Meister, Lucius, & Brüning. Manufacture of derivatives of 3:3'-diamino-4:4'-dioxoarsenobene. 33848. November 30. (Germany, December 12, 1919.)

" Manufacture of esters of dioxidoethyl sulphide. 34231. December 3. (Germany, January 20, 1919.)

Gill, H. A. (Sharples Speciality Co.). Centrifugal separation of substances. 33638. November 29.

Harding, K., and Jones, E. Production of sodium pentaborate, borax, or boric acid from boron ores. 34193. December 3.

Leprester, R. Apparatus for catalytic synthesis of ammonia. 34124. December 2.

Merz & McLellan. Production of steam for carbonisation plant for large-scale power production. 34261. December 3.

Minerals Separation, Ltd., and Simpson, T. R. Concentration of ores containing elemental sulphur. 34141. December 2.

Moeller, J. Manufacture of gas from carbonaceous materials. 33708. November 30.

Morgan, F. J., Thomas, J. G., and Williams, E. Appliance for converting pressure produced by chemical reaction of water and calcium carbide into work, &c. 33904. December 1.

Reynard, O. Processes involving reactions between gases and liquids. 33850. November 30.

Techno-Chemical Laboratories, Ltd. Preparation of lignite. 34207. December 3.

Finsbury Technical College

OUR attention has again been drawn to the work of the Finsbury Technical College Defence Committee. It will be remembered that a short time ago, following the announcement that the College was threatened with closing in July, 1921, a defence committee was formed to consider the possibility of helping in any way the carrying on the work of the college.

We have received a letter from the Chairman of the Defence Committee, Mr. J. H. Coste, in which he says:

" It is no criticism of modern university methods, with their adherence to a strict syllabus of preparation for examinations, to emphasise the importance of maintaining this pioneer institution, the characteristics of which have been a minimum of examinations, independent practical work, with its self-teaching advantages, and the great freedom allowed in the methods of instruction. This has been its role in the past and it has on that account been held in high esteem throughout the long period of its existence.

" A few leaders in education and applied science are being invited to a private conference to be held at the Institute of Chemistry, 30, Russell Square, London, W.C., on Wednesday, December 15th, 1920, at 5 p.m., to review this matter and to take such action as may be deemed advisable."

All old Finsbury students are invited to communicate with Dr. Atkinson at Leonard Street, signifying their intention of becoming allied with the movement as members of the Defence Committee. It would also help considerably if those who have already joined the movement would endeavour to make known among any of their friends who are interested in the college that their help is urgently needed.

Monthly Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

British Market Report

THURSDAY, December 9.

Markets generally speaking remain extremely slow and without any items of outstanding interest. On the whole, values still show a tendency to contract due rather to absence of demand than to changes in intrinsic value. It is thought on the whole, however, that we have passed the worst, and that after the annual stock taking, we may look for better things.

There is nothing new to report in regard to export markets, which remain very uninteresting.

General Chemicals

ACETONE.—The position is still maintained, and with a good inquiry, higher prices are not unlikely.

ACID ACETIC appears to have touched bottom for the moment, and there is a tendency towards a recovery in values. The demand continues steady and stocks have been materially reduced.

ACID CARBOLIC remains very sick and favours buyers.

ACID FORMIC.—Prices are lower consequent upon Continental competition. The quantities offered, however, are on the small side, and an improvement in demand would quickly affect the general situation.

ACID OXALIC is very quiet indeed, and only a small amount of buying is done and that for hand to mouth requirements. The price is nominally unchanged.

ACID TARTARIC.—Resale parcels have again been in evidence, but the undertone is not unsatisfactory.

COPPER SULPHATE shows no improvement, and it is difficult to see where a change for the better can come from until export markets re-open.

FORMALDEHYDE.—The downward movement which we reported last week has been arrested, but the demand remains very slow.

LEAD SALTS.—There is not much inquiry and the market is easy.

MAGNESIUM SALTS continue on offer with downward tendency.

POTASSIUM BICHROMATE is lifeless, but holdings are only small.

POTASSIUM PRUSSIATE remains a firm market, the demand keeping pace with supplies.

SODA ACETATE has been in much better inquiry, and the price is fully maintained.

SODA BICHROMATE.—The market has been influenced by re-sale parcels, and on the whole the second-hand price is rather lower.

SODA NITRITE is easier in price, and in very limited demand.

SODA PRUSSIATE is rather lower consequent upon Continental offerings. A moderate business is passing.

Coal Tar Intermediates

There is little to report in the intermediate section, and business remains on the quiet side. The undertone, however, is quite firm, and we are of opinion that little further decline can be expected for the present.

ALPHA NAPHTHOL is without change in value, and trade is on the small side.

BETA NAPHTHOL seems to be improving and with any increase in the demand, the price should quickly respond.

DIMETHYLANILINE has been in better request and price is steady.

DINITROCHLORBENZOL is in moderate demand at last quoted prices.

PHTHALIC ANHYDRIDE is stagnant and the price continues in buyers' favour.

PARANITRANILINE is slow in demand, but the value is well maintained.

SALICYLIC ACID is a level market this week, and some fair orders have been placed at the low ruling levels. Makers hold firmly to their recent quotations.

Coal Tar Products

There is little change to report in our market since last week. 90 PER CENT. BENZOL appears to be slightly easier, and spot lots are offering in the North at 3s. 6d. on rails, and 3s. 8d. to 3s. 9d. in London.

PURE BENZOL is worth 3s. 10d. to 4s. on rails.

CREOSOTE OIL remains steady at 1s. 2d. on rails in the North, and 1s. 3d. in the South.

CRESYLIC ACID remains unchanged at 3s. 11d. on rails for 95/97 per cent., and 4s. 6d. for the Pale quality 97/99 per cent.

SOLVENT NAPHTHA is quiet at 2s. 9d. on rails.

HEAVY NAPHTHA is worth 3s. to 3s. 2d. on rails.

NAPHTHALENE.—There is no change in prices, Crude being worth from £10 to £20, and Refined from £35 to £40.

PITCH.—The divergence in views between buyers and sellers continues and business remains difficult. Approximate values are 205s. to 210s. f.o.b. London, 200s. to 205s. f.o.b. East Coast Port, and 195s. to 200s. f.o.b. West Coast Port.

Sulphate of Ammonia

There is nothing new to report.

French Market Report

This market is in a stagnant condition, and practically no business is passing. Many merchants are still overstocked with stocks and make concessions in order to clear.

There seems no fresh prospect of an improvement in the demand.

ACID ACETIC 80 PER CENT. technical is 490 frs. per 100 kilos. ACID CITRIC is 23 frs. per kilo.

ACID OXALIC is 1200 frs. per 100 kilos.

ACID TARTARIC is 15 frs. per kilo, with little demand.

ALUM CHROME is in better request at about 450 frs. per 100 kilos.

COPPER SULPHATE is inquired for, but little business has been done. The market is about 215 frs. per 100 kilos.

HYDROGEN PEROXIDE is 150 frs. per 100 kilos.

FORMALDEHYDE may be taken at 1450 frs. per 100 kilos, with a very small sale.

LITHOPONE is 235 frs. per 100 kilos.

LEAD ACETATE is in fair request at 450 frs. per 100 kilos.

LEAD NITRATE is firm at 500 frs. per 100 kilos.

POTASSIUM PERMANGANATE is standing at 22 frs. per kilo.

POTASSIUM PRUSSIATE is 1250 frs. per 100 kilos.

SODIUM ARSENATE is in fair request at 325 frs.

SODIUM BICHROMATE is 100 frs. per 100 kilos.

SODIUM BICARBONATE is slow of sale at 650 frs. per 100 kilos.

SODIUM PHOSPHATE is 150 frs. per 100 kilos.

SODIUM PRUSSIATE is slow of sale at 800 frs. per 100 kilos.

SODIUM SULPHITE is in fair request at 160 frs. per cent. kilos.

SODIUM SULPHIDE concentrated is in fair demand at 255 frs.

German Market Report

December 8.

Business has been in a very unsettled state in this market, probably in the main due to the exchange fluctuations.

The demand on export account has been fairly satisfactory.

ACID FORMIC is on offer at 16 marks per kilo.

ACID OXALIC is in somewhat better request, and the price is about 22 marks per kilo.

ALUMINA SULPHATE is in slow demand at about 250 marks per 100 kilos.

ALUM CHROME is in request and the price may be taken as 10 marks per kilo.

AMMONIUM CARBONATE is slow of sale and is offered at about 8 marks per kilo.

FORMALDEHYDE is ruling at about 32 marks per kilo, with very little business passing.

LEAD SALTS are slow of sale and inclined to favour buyers.

POTASSIUM META BISULPHITE is scarce at 24 marks per kilo.

POTASSIUM PERMANGANATE is weak at 55 marks per kilo.

SODIUM HYPOSULPHITE is about 7 marks per kilo.

SODIUM NITRITE is slow of sale at 14 marks per kilo.

SODIUM SULPHIDE is in good demand at 8 marks per kilo.

Current Prices

Chemicals

	per	£	s.	d.	per	£	s.	d.
Acetic anhydride	lb.	0	2	6	to	0	3	0
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	115	0	0	to	120	0	0
Acid, Acetic, glacial, 99-100%	ton	77	10	0	to	80	0	0
Acetic, 80% pure	ton	65	10	0	to	66	0	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst.	ton	74	10	0	to	76	0	0
Carbolic, cryst. 39-40%	lb.	0	0	10 $\frac{1}{2}$	to	0	0	11
Citric	lb.	0	3	0	to	0	3	3
Formic, 80%	ton	90	0	0	to	95	0	0
Gallic, pure	lb.	0	6	3	to	0	6	6
Hydrofluoric	lb.	0	0	8 $\frac{1}{2}$	to	0	0	9
Lactic, 50 vol.	ton	37	10	0	to	40	0	0
Lactic, 60 vol.	ton	47	10	0	to	50	0	0
Nitric, 80 Tw.	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	1	5	to	0	1	6
Phosphoric, 1.5	ton	65	0	0	to	67	0	0
Pyrogallic, cryst.	lb.	0	11	6	to	0	11	9
Salicylic, Technical	lb.	0	1	8	to	0	1	10
Salicylic, B.P.	lb.	0	2	0	to	0	2	3
Sulphuric, 92-93%	ton	8	10	0	to	8	15	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	2	4	to	0	2	8
Alum, lump	ton	19	10	0	to	20	0	0
Alum, chrome	ton	60	0	0	to	65	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	17	10	0	to	18	10	0
Aluminium, sulphate, 17-18%	ton	20	10	0	to	21	10	0
Ammonia, anhydrous	lb.	0	2	2	to	0	2	4
Ammonia, 88%	ton	43	0	0	to	45	0	0
Ammonia, 92%	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	7 $\frac{1}{2}$	to	—		
Ammonia, chloride	ton	95	0	0	to	100	0	0
Ammonia, muriate (galvanisers)	ton	60	0	0	to	65	0	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	110	0	0	to	115	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	3
Amyl acetate	ton	420	0	0	to	425	0	0
Arsenic, white, powdered	ton	80	0	0	to	82	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	23	0	0	to	24	0	0
Nitrate	ton	55	0	0	to	56	0	0
Barium Sulphate, blanc fixe, dry	ton	30	0	0	to	31	0	0
Sulphate, blanc fixe, pulp	ton	16	10	0	to	17	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	8
Bleaching powder, 35-37%	ton	30	0	0	to	31	0	0
Borax crystals	ton	41	0	0	to	42	10	0
Calcium acetate, Brown	ton	19	0	0	to	20	0	0
Grey	ton	29	0	0	to	30	0	0
Calcium Carbide	ton	29	0	0	to	30	0	0
Chloride	ton	12	10	0	to	13	0	0
Carbon bisulphide	ton	65	0	0	to	67	0	0
Casein, technical	ton	90	0	0	to	92	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	11	6	to	0	12	6
Oxide, black	lb.	1	0	0	to	1	0	6
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	41	0	0	to	42	0	0
Cream Tartar, 98-100%	ton	220	0	0	to	225	0	0
Epsom salts (see Magnesium sulphate)								
Formaldehyde 40% vol.	ton	135	0	0	to	140	0	0
Formusol (Rongalite)	lb.	0	4	9	to	0	5	1
Glauber salts	ton	Nominal.						
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	67	10	0	to	70	0	0
Carbonate (White Lead)	ton	61	0	0	to	63	0	0
Nitrate	ton	62	10	0	to	65	0	0
Litharge	ton	57	0	0	to	59	0	0
Lithopone, 30%	ton	40	0	0	to	41	0	0

	per	£	s.	d.	per	£	s.	d.
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	12	10	0	to	13	0	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate	ton	190	0	0	to	—		
Sulphate	ton	130	0	0	to	135	0	0
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	gall.	Nominal.						
Nickel sulphate, single salt	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potassium bichromate	lb.	0	1	3	to	0	1	4
Carbonate, 90%	ton	90	0	0	to	95	0	0
Chloride	ton	50	0	0	to	52	0	0
Chlorate	lb.	0	0	8 $\frac{1}{2}$	to	0	0	9
Meta bisulphite, 50-52%	ton	215	0	0	to	225	0	0
Nitrate, refined	ton	65	0	0	to	67	0	0
Fermanganate	lb.	0	3	0	to	0	3	3
Prussiate, red	lb.	0	3	3	to	0	3	6
Prussiate, yellow	lb.	0	1	10	to	0	2	2
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	5	10	0	to	—		
Seconds	cwt.	5	5	0	to	—		
Sodium acetate	ton	48	0	0	to	50	0	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	9 $\frac{1}{2}$	to	0	0	10
Bisulphite, 60-62%	ton	37	10	0	to	40	0	0
Chlorate	lb.	0	0	5 $\frac{1}{2}$	to	0	0	5 $\frac{1}{2}$
Caustic, 70%	ton	30	0	0	to	31	0	0
Caustic, 76%	ton	31	0	0	to	32	0	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	27	10	0	to	30	0	0
Nitrite, 96-98%	ton	69	0	0	to	70	0	0
Phosphate, crystal	ton	37	0	0	to	39	0	0
Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	1	1	to	0	1	1 $\frac{1}{2}$
Sulphide, crystals	ton	25	0	0	to	27	10	0
Sulphide, solid, 60-62%	ton	45	0	0	to	47	0	0
Sulphite, cryst.	ton	17	10	0	to	18	10	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Strontium Nitrate	ton	90	0	0	to	95	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	19	0	0	to	19	10	0
Roll	ton	19	0	0	to	19	10	0
Tartar emetic	lb.	0	2	10	to	0	3	0
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb.	0	2	0	to	0	2	1
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	56	0	0	to	57	0	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	21	0	0	to	23	10	0
	Coal Tar Intermediates, &c.							
Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	4	6	to	0	4	9
Alphanaphthylamine	lb.	0	3	3	to	0	3	6
Aniline oil, drums extra	lb.	0	1	8	to	0	1	9
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.	—			to	—		
Benzaldehyde (free of chlorine)	lb.	0	5	9	to	0	6	0
Benzidine, base	lb.	0	11	6	to	0	12	0
Benzidine, sulphate	lb.	0	10	0	to	0	10	6
Benzoic acid	lb.	0	2	9	to	0	3	0
Benzote of soda	lb.	0	3	0	to	0	3	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzene	lb.	0	10	0	to	0	11	0
Betanaphthol	lb.	0	3	0	to	0	3	3
Betanaphthylamine, technical	lb.	0	11	6	to	0	12	6
Croceine Acid, 100% basis	lb.	0	5	0	to	0	6	3
Dichlorobenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorobenzol	lb.	0	1	6	to	0	1	8
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	3	0	to	0	3	3
Dimethylaniline	lb.	0	5	9	to	0	6	0
Diphenylamine	lb.	0	5	0	to	0	5	3
H-Acid	lb.	0	14	0	to	0	14	6
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorobenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)								

	per	£	s.	d.	per	£	s.	d.
Naphthionate of Soda.....	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid...	lb.	0	5	0	to	0	5	6
Nitronaphthaline	lb.	0	1	6	to	0	1	8
Nitrotoluol	lb.	0	1	4	to	0	1	5
Orthoamidophenol, base.....	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine.....	lb.	0	2	3	to	0	2	6
Orthonitrotoluol.....	lb.	0	1	3	to	0	1	4
Para-amidophenol, base	lb.	0	12	6	to	0	13	0
Para-amidophenol, hydrochlor	lb.	0	13	0	to	0	13	6
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	7	6	to	0	7	9
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	6
Paratoluidine.....	lb.	0	8	3	to	0	8	6
Phthalic anhydride.....	lb.	0	4	9	to	0	5	0
R. Salt, 100% basis.....	lb.	0	4	0	to	0	4	1
Resorcin, technical	lb.	0	7	6	to	0	8	6
Resorcin, pure	lb.	1	2	0	to	0	12	6
Salol	lb.	0	4	6	to	0	4	9
Shaeffer acid, 100% basis.....	lb.	0	3	6	to	0	3	0
Sulphanilic acid, crude	lb.	0	1	8	to	0	1	9
Tolidine, base	lb.	0	8	6	to	0	10	0
Tolidine, mixture	lb.	0	2	9	to	0	3	0

The following prices are furnished by Messrs. Miles, Mole & Co., Ltd., 101, Leadenhall Street, London, E.C.

Metals and Ferro Alloys

	per	£	s.	d.	per	£	s.	d.
Aluminium, 98-99%.....	ton	185	0	0	to	186	0	0
Antimony, English.....	ton	52	0	0	to	53	0	0
Copper, Best Selected	ton	81	0	0	to	83	0	0
Ferro-Chrome, 60%	ton	42	0	0	to	43	0	0
Manganese, loose	ton	35	0	0	to	36	0	0
Silicon, 45-50%.....	ton	23	0	0	to	24	0	0
Tungsten, 75-80%	lb.	0	3	3	to	0	3	6
Lead Ingot	ton	25	0	0	to	26	0	0
Lead Sheets.....	ton	37	0	0	to	38	0	0
Nickel, 98-99%.....	ton	48	0	0	to	49	0	0
Tin	ton	212	0	0	to	213	0	0
Spelter	ton	31	0	0	to	32	0	0

Structural Steel

	ton	£	s.	d.
Angles and Tees	ton	24	0	0
Rounds and Flats	ton	22	0	0
Joists	ton	23	0	0
Plates	ton	23	0	0
Rails, heavy	ton	24	0	0
Sheets, 24 Gauge	ton	31	0	0
Galvd. Corrd. Sheets	ton	32	0	0
Zinc Sheets	ton	60	0	0

Foreign Samples Exhibition

Mr. F. G. KELLAWAY, M.P., Parliamentary Secretary of the Department of Overseas Trade, opened the Foreign Samples Exhibition at 7-11, Old Bailey, E.C. 4, on Tuesday.

The exhibition was originally at Basinghall Street, but the accommodation was inadequate for the purpose, and the use made of it by manufacturers justified larger space.

Mr. Kellaway said that unless we resecured and extended our pre-war position in the foreign markets of the world the outlook for this country was grave. British industry had certainly made a very remarkable recovery, but we were faced with depression especially with regard to our trade with Eastern Countries. He said, the Department of Overseas Trade was purely an advisory party with no power of control, they could not issue orders. The exhibition, which he was opening was one of the means to induce the British manufacturer to secure the Overseas markets. There were over 100,000 samples. When the exhibition was in Basinghall Street 4,308 samples were lent to manufacturers. The exhibition was not open to the general public, it was only to be used by British firms intent on business with overseas markets. There was no information on the samples themselves, moreover very great care would be taken by the officials that information was only given to British houses which applied for it. It would be no good people going there in the hope of getting addresses of firms in foreign countries who made the goods exhibited with a view to buying up stuff for importing into this country cheaply. The samples were to show what was being made for

overseas markets and how by making them here we could capture the markets abroad.

It was good also for employers to show their employees what other countries were making in order to give the idea as to how it could be made in this country. Mr. Kellaway gave the instance of a German plough which was being sold in South Africa. Parts of the plough were brought to this country, British workmen turned out similar articles, or better, and orders for 150 ploughs were received by the manufacturing firm. That was typical of what might be done, and it was for that purpose that the exhibition was being opened.

Chemicals and dyes are represented, and soaps, perfumes, and pharmaceutical goods are among the exhibits. There is also a library containing 15,000 foreign trade catalogues.

November Trade Returns

Export and Import Increases

DESPITE the pessimistic reports pointing out gloomy prospects for British trade in the near future, returns revealing November's results are decidedly on the bright side. Exports show an increase of £32,254,463, as compared with the 1919 figures, the amount this year being £119,304,994. Imports have also increased, £144,260,183 for the month being £714,982 more than last year.

A decrease of £7,151,550 is shown in Re-Exports, the figure for which is given as £13,114,859. The adverse balance of trade, with the exception of July, is lower than it has been all the year and now stands at £11,780,000. In comparison with the previous month imports have fallen £5,629,000. Exports of raw materials were also lower, but in most classes of manufactured goods and foodstuffs there was expansion.

Dyestuffs show a falling off as compared with the exports of the corresponding month last year, but for the eleven months of 1920 a substantial increase is recorded, the total for that period being 287,146 cwt., as against 151,678 cwt. last year. In 1913 the figure was 200,507 cwt.

Coal Chemicals and Dyes.

During November coal to the value of £5,681,484 was exported, a decrease of £2,847,703, as compared with November, 1919.

Among the manufactured articles exported, chemicals, drugs, dyes and colours are given, the value for the month being £3,601,114, an increase of £1,018,361 over the corresponding figure for 1919. Oils, fats and resins manufactured exported were £775,307, or £684,785 less than the previous November.

With regard to imports chemicals, drugs, dyes and colours show an increase for the month of £2,290,922 over the corresponding month last year, the figure being £3,961,062. Oils, fats and resins manufactured increased by £5,978,065, the import figure this November being £8,934,754.

In order to show the comparison with 1913 of the quantities shipped abroad in November this year and in 1919, the following items are tabulated:—

	1913. tons.	1919. tons.	1920. tons.
Edible oils and fats	4,149	1,079	3,319
Salt	30,897	34,145	29,197
Coal.....	5,913,404	2,747,476	1,360,724
Oils, fats, &c.	9,405	14,343	14,139
Coal tar, pitch	56,766	62,935	52,081
Cement	49,086	40,640	47,145
Soda compounds	493,151	598,682	668,208
Dyestuffs	22,376	19,333	17,289
Soap	133,199	210,560	100,398

Agricultural & General Engineers, Ltd., of Central House, Kingsway, London, announce that the selling policy of the company is now based on firm quotations for all their well-known products. The company includes the following firms: Aveling & Porter, Ltd., Barford & Perkins, Ltd., E.H. Bentall & Co., Ltd., Blackstone & Co., Ltd., Peter Brotherhood, Ltd., Charles Burrell & Sons, Ltd., Burrell's Hiring Co., Ltd., Clarke's Crank & Forge Co., Ltd., Davey, Paxman & Co., Ltd., Richard Garrett & Sons, Ltd., James & Fredk. Howard, Ltd., L. R. Knapp & Co., Ltd., E. R. & F. Turner, Ltd., A. G. E. Electric Motors, Ltd.

Company News

INTERNATIONAL PETROLEUM.—A dividend of 25 cents per share (1s. 0½d.), less tax, payable on January 3, will be paid (Coupon 1). This is half the amount paid last year.

BRITISH OXYGEN.—An interim dividend of 5 per cent. (1s. per old share and 6s. per new share), tax free, payable on December 20, has been declared. This is the same as for last year.

BRITISH CYANIDES.—For the half-year, an interim dividend at the rate of 10 per cent. per annum (1s. per share), tax free, on ordinary shares becomes payable on December 16. Same as for last year.

SPIES PETROLEUM.—The ordinary general meeting was held on December 6. No accounts were submitted in the report as information from Russia has been cut off for nearly a year) and it was impossible to get figures on which to base a statement. It was agreed to pay a final dividend of 5s. per share free of income tax, on December 8, making, with the interim dividend of 2s. per share paid in June, a total distribution for the year of 7s. per share free of income tax.

EMBA CASPIAN OIL.—It has so far proved impracticable to communicate with the Russian company, the Emba Caspian Naphta Industrial Co., Ltd. The report for the year to Oct. 31 states that no change has been made in the rate of exchange at which the company's roubles deposits in Petrograd, and that portion of Russian Company's loan account, which represents interest, have been brought into the accounts, which therefore stand at the exchange rate of 50 roubles to the £. During the year a third dividend of 2d. in the £, amounting to £4,011, has been received from the liquidator of the Canadian Agency, Ltd., in liquidation, and has been applied to the reduction of underwriting commission account, which now stands at £2,760.

TAR OIL AND COAL.—The directors have issued their first report. As the financial year does not end until March 31 next, no accounts are presented. After providing for expenditure in France, there remains a cash balance in hand of £136,671. The reserves of oil already proven at Boson are stated at 75,000,000 gallons. The bituminous and anthracite coal seams have been followed for a length of three miles, and mining work has sufficiently advanced to anticipate regular coal output in January. Coal costs for the coming year are estimated at 18s. 2d. per ton, against a present gross selling price of £6 7s. per ton. A new shale oil area has been acquired at Autun on which many millions of tons of shale have already been proven, sufficient for a basis of treatment of 2,000 tons daily at an estimated profit of £1 12s. 8d. per ton.

LIVERPOOL NITRATE.—Net profits on the year's working was stated by the chairman at the annual general meeting at Liverpool on December 2 to be £126,997, as against £84,354, an increase of £42,000 over the previous year. Gross profit of £247,985 is shown in the report, compared with £167,576, an increase of over £80,000. Deductions were larger, £25,759 as against £15,221. Stocks of nitrate and stores amount to £585,198, or £150,000 more than last year. Income tax, which was nearly £10,000 more than in 1919, amounted to £46,838. The company, which originally possessed one nitrate establishment, now owns six oficinas, each with complete nitrate-making plants. The chairman pointed out that the unsatisfactory state of the Continental Exchanges was having a marked effect on the buying of nitrate for the coming season. Germany and Austria remained closed markets, and France, Belgium and Holland would only buy at prices which would result in enormous losses to the importer. The United States position was unsatisfactory to the importer; instead of the expectation of a big increase in the world's consumption, there might be a heavy fall, notwithstanding that the land was impoverished through insufficiency of manuring, and its productive powers deteriorating in an accumulative degree. The directors believed that France would have to import cereals and sugar for her own needs, instead of exporting them, and the same was said of Germany and other countries. The loss of products from insufficiently fertilised land was enormous. It was stated that a diminution in manuring of 100,000 tons of nitrogen resulted in a loss of 2,000,000 tons of cereals. With nitrate it was not so much a case of over-production, but one in which the continental farmer was unable to pay for it, despite the fact that it might be more economical for the

public to import artificial fertilisers rather than foreign grain foodstuffs. Nitrate was an article which lent itself to bartering goods for goods, but it required great financial resources to carry such a policy through, a policy which private traders could not undertake unassisted. The importers were therefore faced with very heavy losses. While these large stocks were not absorbed it would bring about a much graver situation if the association were to put more nitrate on the market, and they had therefore decided to suspend selling until the position becomes clearer, and, in addition, it would probably become necessary to restrict production. Meanwhile, negotiations were being actively pursued to obtain the adhesion of all producers to the combination.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
Toronto ...	Chemicals; dyestuffs; colours; tanning materials; gums. Inquiries to the Canadian Government Trade Commissioner's Office, Portland House, 73, Basinghall Street, London, E.C. 2.	—
Latvia ...	Magnesium; soluble glass; powdered flint	733
China (Chefoo)	Soap	778
Porto Alegre...	Paints; varnishes...	786
Argentine, Uruguay	Paints; varnishes...	784
Hungary ...	Jute; machine oil...	812
Auckland ...	Heavy chemicals	802
Lima (Peru) .	Chemicals; drugs; glass; glass-ware; soap	—
Wellington ...	Chemicals	800
Australia ...	Drugs; chemicals...	412/20/7 330
	Replies to the Official Secretary, Commonwealth of Australia Commercial Information Bureau, Australia House, Strand, London, W.C.2., quoting reference number.	

Big Dye Case Opened

COMPLICATED test actions were started in the Chancery Division on Tuesday, before Mr. Justice Russell, respecting claims by English companies against English agents of German dye concerns to recover damages which were stated to amount to millions of pounds.

Claims were for alleged breach of contracts made before the war to supply various kinds of dyes to a large number of manufacturers in this country. Mr. Gover, K.C., represented the Calico Printers Association, Bradford Cotton and Wool Dyers' Association, the Indigo Buying Amalgamation, the Executors of Thomas Welch, and F. Scott & Co. for claims amounting to nearly £3,000,000. The United Turkey Red Co. is also concerned. Defendants are the Badische Co., Ltd., the Bayer Co., Ltd., the Greinsheim Electron, Ltd., Kalle & Co., Ltd., the Berlin Aniline Co., Ltd., and Meister Lucius & Bruning, Ltd.

Counsel said that the cases were in two categories, the indigo class and the colour class. In addition to the claims for damages there were also in some cases claims for rebates in respect of goods not delivered.

MR. H. E. COLEY, hon. secretary of the Chemical Industry Club, has just returned home after a commercial tour extending over eight months in the Far East.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

[NOTE.—*The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

SUMMERS CARBONIZING SYNDICATE LTD., London, S.W.—Registered November 23 (by order on terms), £1,000 mortgage, to Sheepbridge Coal & Iron Co., Ltd., Chesterfield; charged on coal carbonizing oven at Glapwell, with gas plant, machinery, &c. *—April 26, 1920.

TAYLOR'S DRUG CO., LTD., Leeds.—Registered November 20, £1,200 mortgage, to D. E. Speight, Leeds, solicitor; charged on land and premises, &c., at Hull. *£1,669 17s. 1d. October 25, 1920.

Satisfaction

STANSELL'S ACETYLENE CO., LTD., Exeter.—Satisfaction registered November 26, £140, registered May 4, 1914.

Bills of Sale

[The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.]

ELLIS, GEORGE, 2, Nesfield Street, Walton, Liverpool, oil filterer.—Filed December 3, £30.

FOLEY, ERNEST G., 37, Clarence Road, Wood Green, glass blower.—Filed December 3, £130.

THOMAS, GEORGE, Beryl House, Conway Road, Paignton, analytical chemist.—Filed November 2, £100.

County Court Judgments

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

LONGMAN, WILFRED J. H., Weylands, Radipole, chemist. £13 12s. 1d. October 21.

NOBLES DRUG STORES, LTD., 2, Well Street, London, E., druggists. £18 2s. 8d., October 12.

New Companies Registered

The following have been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.:

DAVID WEIR, LTD., 175, Oxford Road, Burnley. Chemists, druggists, drysalters, &c. Nominal capital, £600 in 600 shares of £1 each. Directors: D. Weir, Mary A. Weir. Qualification of directors, one share.

J. J. HADFIELD, LTD., Garrison Bleach Works, Birch Vale, Derby. Bleacher. Nominal capital, £200,000 in 200,000 shares of £1 each. Directors: T. Hadfield, Wright Hadfield, C. Hadfield, F. Hadfield, William Hadfield. Qualification of directors, £500. Remuneration of directors, £1,000 each.

MARLEY HILL CHEMICAL CO., LTD. Manufacturers of chemical products. Nominal capital, £300,000 in 300,000 shares of £1 each. Directors: R. S. Gardiner, Major G. H. Palmer, A. N. Palmer, J. M. Walsh, G. A. Western. Qualification of directors, £500. Remuneration of directors, £300 each; chairman, £400.

ORGANIC COMPOUNDS, LTD., Sheffield Works, 29, Hythe Road, Willesden Junction, W.10. Manufacturing chemists and druggists. Nominal capital, £2,500 in 2,400 10 per cent, cumulative preference ordinary shares of £1 each, and 2,000 deferred ordinary shares of 1s. each. Directors: R. Boucher, J. Ronald. Qualification of directors, one share.

UTILITY PATENTS, LTD. To acquire any Patent or Patent rights and turn same to account. Nominal capital, £1,000 in 1,000 shares of £1 each. Directors to be appointed by subscribers. Remuneration of directors, £100. Subscribers: H. E. Samuel, S. B. Watts.

WAITE'S BRITISH CHEMISTS, LTD., 27, Bedford Street, North Shields, Northumberland. Chemists and druggists. Nominal capital, £20,000 in 20,000 shares of £1 each. Directors: H. Coates, H. Gregg, A. Waite. Qualification of directors, £100.

The Status of the Works Chemist

A REPRESENTATIVE gathering of the Bristol and South Wales Section of the Society of Chemical Industry met at Cardiff on Friday, December 3, when Dr. V. Stanford read a paper on "The Works Chemist, What He Is, and What He Might Be." Professor Thompson (Cardiff College) presided.

Dr. Stanford dealt at the outset with the status of the works chemist in this country to-day, and contrasted it, and the remuneration attached to such a post, with the conditions in America and Germany. He advocated co-operation with other professional organisations in order to secure a better appreciation of the value of a works chemist on the part of the capitalists, but pointed out that the chemist must prove his worth to the industry before he could hope for the recognition he desired.

During the discussion it was remarked that capitalists had not yet come to understand the value of the chemist to all kinds of industry, with the result that he was still regarded as a commercial commodity with no definite assessed value.

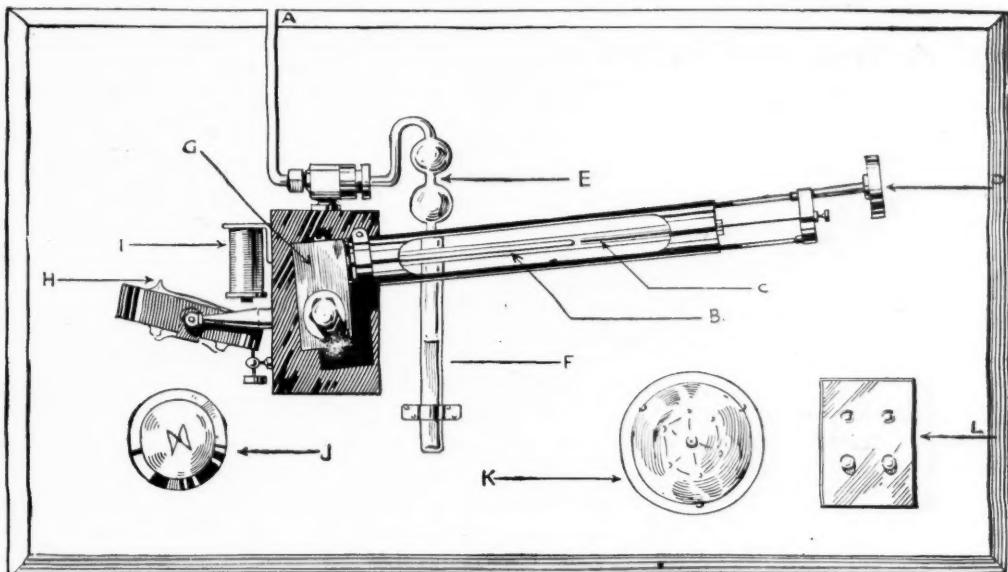
Six Months for a Chemist

PHINEAS KEATS, a chemist, was, at the Birmingham Assizes, on Monday, sentenced to six months' imprisonment in the second division for obtaining from Mr. J. T. Davies cheques for £4,000 and £1,200 by false pretences.

In 1919 Keats began dealings in surplus stores purchased from the Disposal Board, working with two friends who lent him money which they also had borrowed. Keats asked Davies to come in on a deal in hypo soda to the extent of £4,000, telling him he had bought 500 tons at £30 a ton, and that he had already sold at a profit of £7 a ton. Davies gave Keats a cheque for £4,000. The statements about the soda were alleged by the prosecution to be untrue, and made solely for obtaining money. Later, Mr. Davies advanced cheques totalling £1,350 for another deal, but the statements made by Keats to obtain the money, as in the first case, also appears to have been false, and the jury returned a verdict of guilty on all counts, except that of fraudulent conversion.

British and German Training

BEFORE the Chemical Society of the Huddersfield Technical College, on Friday, December 3, Dr. J. Bruce, Ph.D., F.I.C., B.Sc., lectured on "British and German Chemical Training." Dr. Bruce outlined the German general educational system, and commented particularly on the efficient nature of elementary and secondary teaching which prepared students for university and technical training. Dr. Bruce spoke in detail on the great attention devoted to the technical schools in Germany, though he did not consider that the chemical training proper was in itself any better, on the whole, than that of our own modern chemistry schools. We were handicapped by the fact that Germany began its thorough training in scientific and industrial chemistry before we did, and there were more abundant facilities than in England. In practically all instances the chemical work at universities and technical schools was done in separate buildings, properly designed and equipped for general chemistry, as well as for specialised work in all branches, with generous provision for research.



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FREEMAN PRECISION TEMPERATURE CONTROL

A new and perfected method of heat control which eliminates the human element, and is practically fool-proof. We are now prepared to install the FREEMAN PRECISION TEMPERATURE CONTROL—an instrument of vital importance to all Industries using a mobile heating medium. The FREEMAN PRECISION TEMPERATURE CONTROL is an accurate automatic temperature control—not an automatic recorder—which can be used in conjunction with existing Pyrometers and will maintain any temperature indicated by the Pyrometer with dead accuracy, automatically and definitely. The instruments can be installed at any distance from the furnaces they control.

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Economy—1. It will repay its cost in a few months by reducing the consumption of Fuel greatly.
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Precision—It gives exact results—accurate to \pm or $\pm 1^{\circ}$. It accurately controls temperature below zero—to 1400° Centigrade.

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The Organisation of Transport

THE announcement of the proposal to amalgamate no less than 19 dock and transport Trade Unions represents the most important labour movement of recent times. If the scheme now approved by the executive of all these bodies secures, as it no doubt will, the support of the rank and file, a Trade-Union with some 400,000 members will be brought into existence. It is important to notice that the constitution of the new body gives to the executive the right to call a strike without previous consultation with the members as a whole. This complete organisation of transport workers on the road, for it excludes, of course, railwaymen, was only to be expected in view of the enormous rise in the importance of the transport industry since the war ended. The coming together of the workers is not so far balanced by any movement on so large a scale among the employers. Indeed, having regard to the variety of interests on the employing side of the transport industry, it is difficult to see how a big federation could be established at this juncture. The *Transport World and Motor Freight Exchange*, the new weekly to be published by Benn, Brothers, Ltd., in January, comes upon the scene at the psychological moment; it is evident that the transport interests are beginning to talk themselves out, and that we are really witnessing the birth of a new industry, or, at least, a new industrial consciousness. The *Transport World* should be able to do much to guide these new developments and lead them in the right direction.

Chemical Protection by Patents

AT a meeting of the Chemical Section of the Manchester Literary and Philosophical Society Mr. Harold E. Potts opened a discussion on the subject of how best the results of Chemical research might be protected by patents. He said that if the patent agent studied the subject so that he could freely and intelligently criticise the research programme the requirements of the law could be met and research at one and the same time be assisted.

Wetcarbonising : Voluntary Liquidation

At a meeting of the shareholders of Wetcarbonising Ltd., on Thursday, December 2, at which Mr. Gerald Balfour, chairman, presided, it was decided to go into voluntary liquidation. Mr. Balfour said the liabilities were placed at £372,000, and the immediately-realisable assets were practically nil. There was a liability to the Government of about £200,000 (after deduction of scrap value of factory and estimated cost of re-conversion), and the remaining liabilities were made up as follows: To the bank, net, £39,000; to directors, £7,000; to vendor companies, £91,000; to sundry creditors, about £35,000. On April 10, 1912, the amount invested in the company by the present directors and their families was £165,248. Since that time those investments had been increased by £240,399, and they now stood at £405,847. Of the debt owing to the bank upwards of £30,000 represented a loan, for the repayment of which the directors had given their personal guarantee. They could not sustain the burden any longer. All efforts to raise the necessary funds had proved unavailing. The burden of the great debt owing to the Government and the unexampled stringency of the money market during the last six months had defeated all their endeavours. Mr. Ibbott, the secretary, was appointed liquidator. Mr. A. J. Balfour is said to have £60,000 in the concern.

Mr. W. A. Hayward, a young research student at the Imperial College of Science and Technology, South Kensington, was killed by an explosion on Monday while conducting an experiment. Mr. Hayward, who was a senior research student in the Chemical Technology Department of the college, and held a Salter's Fellowship, was examining the behaviour of gases under pressure, a subject to which he had devoted himself for the last two years, when an explosion occurred. A fragment of a Bourdon gauge, the apparatus with which he was working, hit him on the base of the skull, and he died in St. George's Hospital at nine o'clock on Monday night, four hours after the accident. Mr. Hayward was employed during war as a chemist at Gretna Green Explosives Factory.

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